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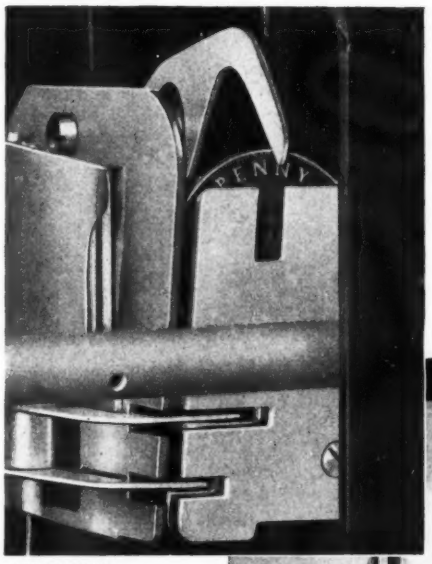

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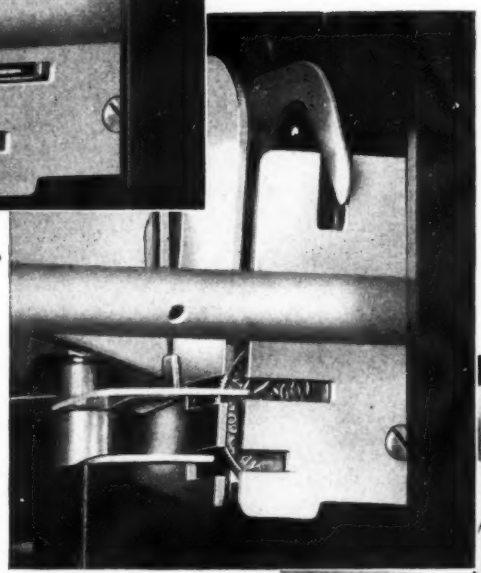

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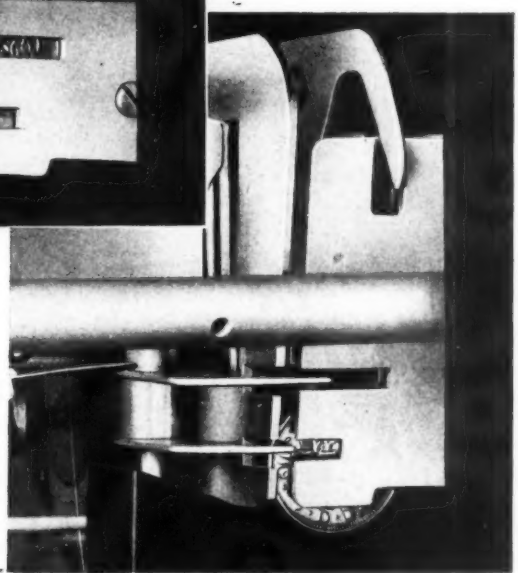

SIXPENNY COIN SELECTOR ARM.

THE CORRECT SELECTION FOR TROUBLE FREE METERING

THREE VIEWS SHOWING THE AUTOMATIC SELECTING AND CALIPERING OF COINS IN THE COIN POCKET.

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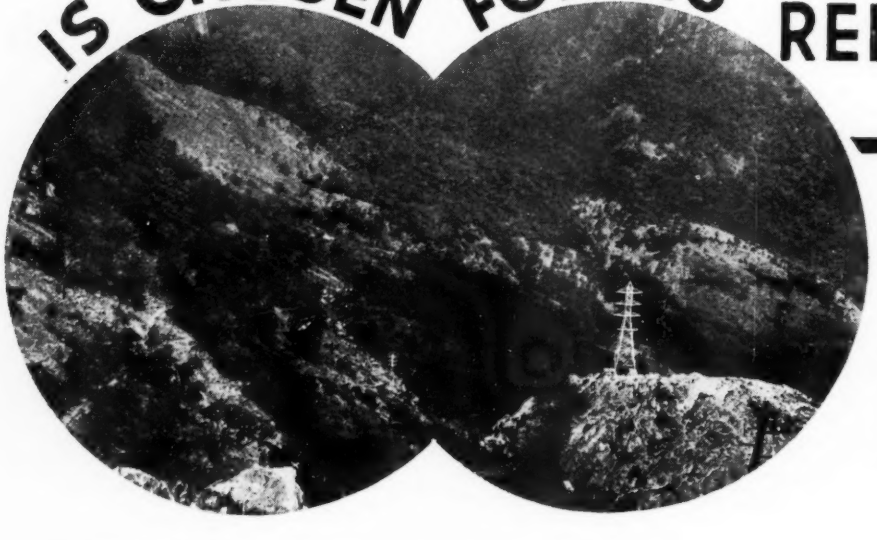

TOP—Hilly country on the Anamalais-Ghat road; steel-cored aluminium has been used for the transmission line in the valley.

LOWER—A long span on the Pollachi-Iyerpadi 22 kV. line. The advantages of steel-cored aluminium conductors are apparent here.

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The
Electrical Review

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We Must Get a Move On

WE are never tired of telling ourselves and the public what a wonderful industry ours is—sales of units steadily rising, new factories going up, exports increasing month by month—until we have begun to believe that we are going about as fast and as far as we possibly can.

But still the bulk of industry is run mechanically; still the majority of people cook, heat their homes, and boil their water by gas and coal; still hundreds of miles of streets are not electrically lighted; and but a small part of our railways has been converted to electric traction.

If we are ever to arrive at the goal of an electrical civilisation within a reasonable time something radical has to be done. We not only want a million more consumers; we also want existing consumers to use more millions of units.

Mr. J. M. Kennedy, in his presidential address to the Institution of Electrical Engineers last week, attacked the complacency which exists. He acknowledged that the industry had done pretty well and was justifying the expenditure upon the grid, but he showed that all this was as nothing compared with the potentialities, and he urged all concerned to get an immediate move on. His theme was the part which electricity was destined to play in clearing the atmosphere, freeing humanity from drudgery, and, by improving conditions in rural areas, helping to relieve the congestion in industrial centres.

Lower prices, he said, were necessary if electricity was to take the place of other agents. This is generally recognised although there are optimists who believe that the "amenity value" will counterbalance any disparity in price. No doubt some consumers will be prepared to make some allowance for the cleanliness and convenience of electricity, but many thousands of people living near or at the subsistence level will be compelled to put up with dirt and inconvenience rather than add to their expenditure.

How are prices to be reduced? In the first place undertakings must be content with a smaller margin of profit than the more speculative industrial enterprise can legitimately look for. Gilt-edged investments must expect only a gilt-edged return. Moreover, the price of the unit must not be swollen to help the rates.

Production costs must be brought down to the minimum. This means generation in efficient up-to-date stations and the elimination of obsolete plant. This is the work which the Central Board is carrying out as fast as possible.

But it is to the distribution side that we must look for the greatest scope for lowering costs. Mr. Kennedy is constantly pointing out that while the output per £ of capital expenditure on generating plant has risen rapidly, the corresponding figure for distribution has not improved.

It is commonly thought that this is due to the extension of the supply into rural districts, but Mr. Kennedy will not have this. And, he says, if it is due to the connection of people with lower incomes the position can be remedied by lowering prices to enable them to raise the general average consumption.

The President is a realist, and when he tells us that we can reach Sir John Snell's goal of 45,000 million units a year in ten or fifteen years, instead of twenty-five, it means that he considers it practicable.

First, however, there must be reorganisation and co-ordination on the distribution side. Mr. Kennedy shows the directions in which this is essential, and in doing so foreshadows the probable trend of the recommendations of the Ministry of Transport Committee on Distribution, whose report is anxiously awaited by the whole industry.

A Useful Guide

WE are constantly being asked how far electricity suppliers are responsible for the alteration or replacement of radio sets which are rendered inoperable by a change in the system of supply. Each time we have to reply that undertakings have various ideas on the subject and adopt different methods. The average set is such a small consumer of energy that an undertaking feels that replacement or conversion is an expensive matter which brings very little return.

This may be strictly true but it isn't the whole of the story. Much goodwill can be created by the proper handling of this admittedly difficult subject—quite apart from the obligation in respect of apparatus which rests upon an undertaking which alters its system. In this issue Mr. D. P. Sayers gives some details of the way in which the Northern Ireland Electricity Board has handled the matter in its large area. Consumers have been generously treated and no fewer than 770 sets have been converted—mainly by the provision of rectifiers. Particulars of the methods employed in the conversion and replacement of other apparatus—domestic, industrial and cinematographic—are also given by the author.

Better Road Lighting

THE Ministry of Transport Committee on Street Lighting has issued an interim report which we summarise in this issue. As the report is principally concerned with main traffic routes perhaps "road lighting" would be a better description of its subject, but be that as it may a number of recommendations are made to which immediate attention might be given. It is interesting to note the endorsement given to the contention by electric lighting authorities that consistency is the most desirable feature of this kind of lighting. Nothing can be worse for a driver than to plunge into dimness or darkness after running through a mile or two of brightly illuminated road. The Committee recommends authorities who are installing new lighting to consult their neighbours in this matter. In general, a mounting height of 25 ft. is considered the most suitable, especially as a means of avoiding glare. The need for the employment of engineers specialising in the work is stressed, as we ourselves have stressed it on many occasions.

Looking Ahead

THERE was nothing comminatory in the imperative "Go to Hull!" used by Sir John Brooke at the inauguration of the extension to Sculcoates power station, and a visit should provide a corrective to any doubting Thomas. In the midst of so much activity in providing service to consumers it is easy to overlook the technical principles on which such developments should be based. That is to say, an ample and flexible distribution system must be planned out well ahead of the demand suggested by an apparently optimistic forecast. The "saw-tooth" effect may delay the attainment of an economic return and hence may make justification of a comprehensive scheme laborious. The will to do so is a test of faith in the future and of the courage of one's convictions. Mr. J. N. Waite, the general manager and engineer at Hull, now receives the reward of his planning, as the cost of connection per consumer in 1934-35 was only £15, as against about £45 in the previous year—a most remarkable reduction.

The Fair Still Bigger

THE demands for space at the Engineering and Hardware Section of the 1936 British Industries Fair are already so large that a big extension to the buildings has again been ordered. The Birmingham Chamber of Commerce, which organises this section, decided a few days ago to add a new building 720 ft. by 72 ft. to the north side, where the electrical and engineering groups of exhibits are situated. The extension will not be devoted entirely to exhibits but will be used partly for the purposes of an exhibitors' club room and new dining and conference rooms for the accommodation of association groups. Anything of this kind which adds to the amenities at Castle Bromwich will be welcomed by the electrical trade. As our readers are already aware the date of the Birmingham Fair is changed back again for 1936 from May to February. One effect of this reversion is the return of the gas industry as an exhibitor. It refrained from taking part in the 1935 show because the month of May was not favoured. We hope that the electrical authorities responsible for the organisation of our section will be able to report at an early date that the electrical trade show will beat all records in 1936.

Aluminium Cooking Utensils

A REPORT issued by the Ministry of Health on "Aluminium in Food" should clear away any misapprehensions that may exist as to the hygienic properties of this metal when used in culinary operations. Aluminium is found to be highly resistant to corrosion by acid foods, although it is attacked by strong acids and alkalis such as soda. The better transference of heat from a boiling ring through the high-conducting medium of a level metal surface, compared with the air pockets found with more easily dented materials, and the lower heat emission from a bright surface make aluminium very suitable for the construction of cooking utensils. The assurance now given as to its harmless character is therefore welcome.

An Unwise Move

HALIFAX has decided to join its Gas and Electricity Departments together in unholy matrimony to eliminate "wasteful competition." The fact that the Gas Committee is in favour of the scheme inevitably arouses the suspicion that whoever is to suffer it will not be the Gas Department and that the benefits if any, will not fall upon the Electricity Department. Although the gas representatives put on a bold front and maintained that there was no suggestion of a "swan song" in their speeches, they admitted that their bird's feathers had been electrically plucked. They portrayed the Gas Department as a poor defenceless orphan while the Electricity Department was "fostered and fathered" by the Central Board. It was in vain that the opposers of the suggestion quoted precedents which had proved how unsatisfactory such an arrangement was and so the proposal to form a Lighting, Power and Heating Committee stands. The Finance Committee admitted that the decision had been made as a matter of principle. It is a pity that due regard to practice was neglected, as no doubt events will show.

Obstruction

A READER whose company has opened a branch in a western town asked for a supply through a prepayment lighting meter. The supply company demanded a deposit of £3 before installing such a meter, but after argument put it in without securing the deposit. Later a prepayment power meter was wanted and again there was a demand for £3. Our correspondent points out that the undertaking could almost finance itself by such methods. The question of protecting the revenue does not arise when prepayment meters are installed. Payment is made in advance and the trouble of meter reading and accounting is avoided. Why, then, ask for a deposit? This seems to be one of the petty irritations which do electricity no good and are better eliminated.

Radio-cookery

THERE is a classic story of a cook who employed a well-known hymn as an egg-timing device—one verse for soft, two for medium and three for hard. The idea has been carried a great deal further in the design of a radio set mentioned in a London court last week. A man sued for the price of the set alleged that it got so hot that "you could fry eggs and bacon on it." Purveyors of these commodities might now utilise one of the Continental advertising radio stations for the broadcasting at the appropriate time of a song of suitable duration to ensure a well-cooked meal upon this new form of breakfast cooker. And talks on cooking might be made more interesting if the receiving set could be used for concurrent practical experiments under the speaker's guidance.

Progress at Hull

The new turbo-alternator and the use for its output

SCULCOATES power station of the Kingston-upon-Hull Corporation is a selected station in the Mid-East England Area of the grid scheme. Early last year the Central Electricity Board issued a direction for the installation of a 25,000-kW turbo-alternator in time for the 1935-36 winter peak, bringing the installed capacity up to 77,000 kW.

The contract was let in July, 1934, erection started at the end of last March and the set was officially put into commission on October 24th. While the machine was being manufactured the Electricity Department (of which Mr. J. N. Waite is general manager and engineer) was altering the roof and the track for the existing 50-ton crane and preparing the foundations and the basement floor. A notable feature of the extension is that the new unit occupies the same space as a 5,000-kW set which it replaces.

General view of the Sculcoates Lane generating station

The turbine is of the single-cylinder duplex-exhaust reaction type running at 3,000 r.p.m. and designed for steam conditions of 375 lb. per sq. in. and 775 deg. F. The spindle is rotated by motor at 20 r.p.m. to prevent distortion when starting up or cooling down. The height of the first row of end-tightened stainless steel blades is 1.4 in. on a rotor diameter of 22 in. and of the last 14¼ in. on a diameter of 44 in.

Efficiency of the New Set

A heat consumption of 10,690 B.th.u. per kWh at 20,000 kW, giving an efficiency of 31.9 per cent., has been achieved. At 25,000 kW (m.c.r.) the thermal efficiency is 31.6 per cent.

The condenser has a total surface of 24,300 sq. ft. in its two halves, each of which is supplied with circulating water by a 19,650-g.p.m. centrifugal pump driven by a slip-ring motor. Vacuum at maximum load is 28.5 in. (bar. 30 in.). Air extraction is by a two-stage steam-jet pump capable of dealing with 118 lb. of air per hr. and condensate extraction by duplicate vertical spindle 960 r.p.m. electrically driven pumps. The latter deliver through the vacuum pump and feed heaters to two electrically driven boiler feed pumps with a duty of 300,000 lb. per hr. against a feed-range pressure of 520 lb. per sq. in.

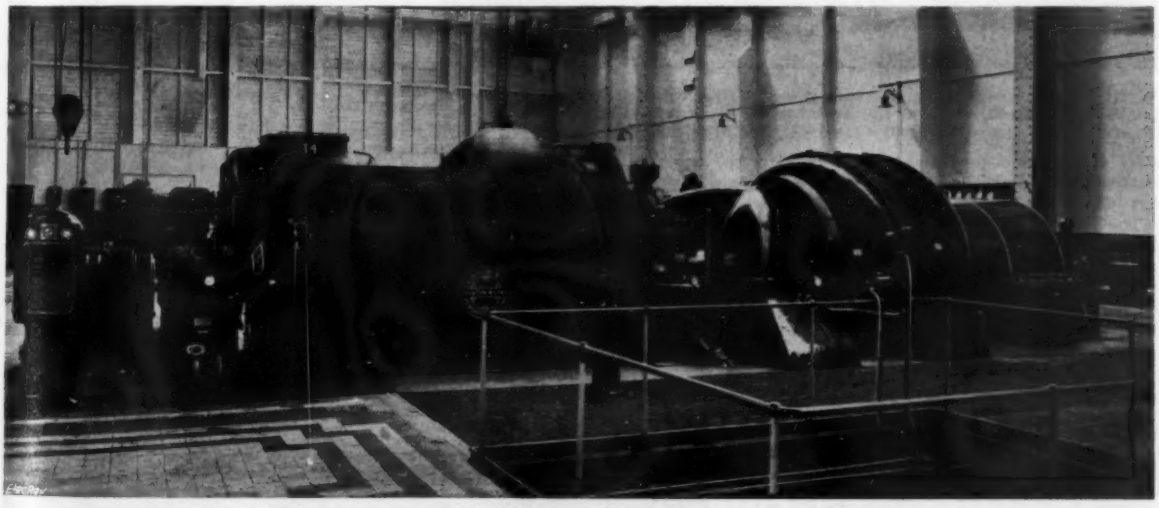
Three-stage bleeding (at 42, 17 and 7 lb. sq. in. abs.) is employed for heating the condensate to 260 deg. F.; the second stage is also taken to an evaporator, from which the vapour enters the l.p. heater. This evaporator has a capacity of 10,000 lb. per hr.—enough make-up feed water for the whole station when carrying a load of 50,000 kW.

The 6.6-kV alternator is rated at a p.f. of 0.8 and its direct-coupled exciter has an output of 90 kW at 290 V. Ventilation is on the closed-circuit system with surface air coolers.

Messrs. C. A. Parsons & Co., Ltd., were the main contractors for the turbo-alternator, condenser, air pump, two extraction pumps, feed-heaters and pipe work and air and oil coolers. The following sub-contractors supplied plant: Messrs. Drysdale & Co. (two c.w. pumps), G. & J. Weir (two boiler feed pumps), P. & B. Evaporators (evaporator), Aiton & Co. (steam range and feed range), James Howden & Co. (Lond.) (alternator fans), A. Reyrolle & Co. (h.v. generator switch and control panel, l.v. distribution panel, Merz-Price protective system and neutral earthing resistance), J. H. Holmes & Co. (all motors for auxiliaries), George Ellison (all starters), Newalls Insulator Co. (insulation), W. Gouldstone & Co. (painting), C. C. Wakefield & Co. (lubrication), G. Kent (metering equipment). Messrs. T. P. Tarran were responsible for the foundations and Messrs. A. E. Jones for structural alterations to the turbine house.

The cost of the extension amounted to £108,000, as alterations previously carried out to the boilers and improvements in the c.w. system avoided the need for appreciable expenditure outside of the turbine room. A further extension is scheduled for 1938 involving the installation of a 30,000-kW (m.c.r.) turbo-alternator by displacing a 10,000-kW unit and two 150,000 lb. per hr. boilers in substitution for two 52,500 lb. boilers. It is quite likely that the next extensions will be needed before the date at present contemplated. Before last week the installed capacity of Sculcoates was 52,000 kW and last winter's peak was 50,080 kW, the grid being relied upon for stand-by. Nevertheless, kWh exported to the grid in 1934-35 exceeded the amount imported, so that with the new set the station should be able to provide appreciable supplies to the grid at a thermal efficiency which maintains the rate of improvement shown in recent years—from about 15 per cent. in 1929 to over 20 per cent. in 1934—a saving equivalent to £38,000 per annum.

The new unit is a fine example of engineering, but this is a quality that it shares with generating sets being installed in other large stations all over the country. The question of prime importance is what is being done about absorbing the output of Sculcoates, which last year was some 150 million kWh, an increase of 14.3 per cent. on the previous year.



The new 25,000-kW Parsons turbo-generator set inaugurated last week

Service—A Working Objective

The clear impression left by an inspection of the system as a whole is that service is regarded as much more than an abstract ideal. It has been turned into a working objective by the team spirit of the staff, technical and commercial, and the enthusiasm of the chief officer.

On entering the showrooms (where the main offices are accommodated) it is seen that prompt attention to the require-

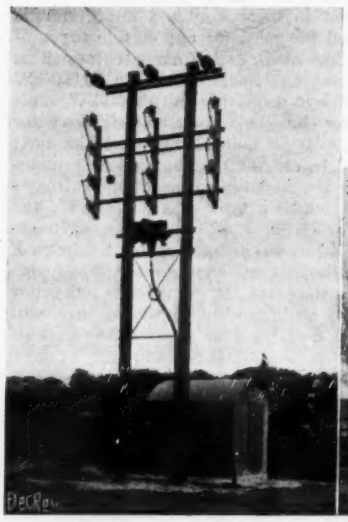
ments of all and sundry is a first consideration of the Department. The cashier's desk is open to receive payments for any account due to the municipality, and non-electrical accounts form an appreciable proportion of the whole, thus extending the field of propaganda of the showrooms. The appeal is continued after nightfall by the attractive lighting of the well-set-out window displays and by the neon signs advertising electricity.

In a side street an electric van equipped for maintenance work stands ready to start off at any moment; on completion of a repair, the driver telephones the office to inquire whether other calls have been received in his absence that can be dealt with from the district in which he happens to be.

The Tariff Policy

Technical improvements are regarded from the standpoint of providing benefits for passing on to consumers, as far as possible in proportion to their support of the undertaking. Thus, little of the £550,000 that has been given in reductions in tariffs in the past five years has gone the way of the flat-rate lighting user (who pays 4½d. to 4d. per kWh), as the principle adopted is that, whether in sale of energy or in hire of apparatus, the price shall be an economic one. The 30,000 domestic consumers who exercise their option to be charged on a two-part tariff pay a secondary rate of ½d. per kWh for the first 360 kWh per quarter and ¼d. above; but the fixed charge is varied from 15 per cent. of the rateable value in the city to 17½ and 20 per cent. in the two rural zones.

Power consumers, even those taking a supply under contract for a term of years, obtain their share of the reduction in costs to which they so materially contribute (the minimum night load during the week is over 30 per cent. of the winter peak and the load factor of the undertaking is over 40 per cent.). Incidentally, the fuel clause variation is that due to coal alone.



Left: A 22,000-V sub-station, showing air-break switches and corrugated building containing transformer and l.p. switchgear. Right: A 6,600-V, 300-kVA sub-station kiosk in a garden village

The commercial value of this "good-will" policy is shown in the connection of 95 per cent. of the power load to the mains, much of the small outstanding amount being due to the use of pass-out back-pressure plant for providing process steam.

In framing an industrial tariff usually the kVA demand is assessed and the energy is charged at stepped rates graded in accordance with consumption. A.c. consumers are charged 12½ per cent. less than d.c. and advice is given in regard to means for reducing the wattless component—a course that has resulted in a p.f. of 95 per cent. for the whole undertaking. Supplies are normally given at low voltage, but where high voltage is called for a rebate of 5s. per kVA (the average cost of transformers and switchgear) and 0.04d. per kWh is allowed.

While the supply of electricity is regarded as the main duty of the undertaking, it is realised that this obligation must be made effective by the provision of apparatus on easy terms, and any appliance of a value of £2 10s. and upwards can be hired. This principle is illustrated in practice by the method of treating water-heater applications. The would-be consumer signs the necessary document and the hot-water service most suitable for his needs is put to work for him (including all plumbing). For new houses one storage heater in the bath-room (with a swivel outlet to feed either bath or basin, which are without taps) and a smaller one in the kitchen is regarded as the best arrangement.

The saving in cost of chimney construction by the introduction of the inset fire on a coloured slate base has markedly influenced builders in favour of providing electric heating in bedrooms.

One type of cooker for hire has been standardised. Several makes were tried by various women and their views alone were taken into account in reducing the number to two or three, the final choice being left to the maintenance staff. No high-speed boiling plates are sent out as it was found that once women became accustomed to the ordinary type objections to slowness ceased to be raised.

Position of the cooker and wash-boiler in a kitchen on the Sutton Trust housing estate

The larger cookers have side and bottom heating and the smaller models top and bottom, as this economises space. From the culinary point of view Mr. Waite considers that the position of the elements is quite immaterial. The undertaking urges hire of apparatus in order to facilitate maintenance and so to ensure reliability.

During the year ended March 31st last 8,389 new connections were made. The rate of progress during the present financial year should be well maintained, as within the last six months a further 3,834 have been added, making the total to date close on 80,000.

The snowball effect of satisfaction with electric cooking is shown by an addition since March of over one-fifth to the total number of cookers hired, which is now more than 10,500. Neither kettles nor special utensils are issued with the cookers, but their use is recommended and the figures of kettles and cookers on hire correspond closely. A similar cumulative result is obtaining with water-heaters, which have added almost two-fifths to their number in the same months, and also with wash-boilers which have advanced to only a slightly less degree.

Diversity of demand plays an important part in keeping tariffs down in Hull. Thus the ice-making plants drop off during the winter and the cement works require little energy in frosty weather.

The diversity between the demands of individual cooker and wash-boiler consumers and the undertaking's peak is better than twenty to one in the case of an estate of 500 semi-detached cottages. The

Left: A small 6,600-V, 50-kVA outdoor sub-station containing combined e.h.p. switches and transformer, together with a l.p. distribution panel. Right: A 6,000-V e.h.p. switch-fuse and 100-kVA transformer unit in timber yard

m.d. of this group is 320 kW, which occurred at 11.30 a.m. on the Monday after the August Bank Holiday and was due to additional laundry. The load on later days in the week was, however, not far short, indicating the existence of marked diversity between cookers and washing-machines. The m.d. of the estate at the time of the undertaking's peak varied only between 100 and 125 kW during the course of a year.

In his belief that the full exploitation of diversity provides the economic justification for low prices for energy, Mr. Waite regards one coal fire in a house as an ally in selling electricity for domestic purposes.

Thirty separate areas outside the city boundaries have been supplied for from one to eight years. Only the eleven most recently connected have not yet provided a surplus, but in the aggregate the rural supplies, which absorb eight million kWh per annum (excluding certain large power consumers), are self-supporting. No serious trouble is found in maintaining voltage, chiefly owing to the use made of automatic boosters. The peak on the rural feeders occurs in the morning.

About half (nearly 5,000) of the street lamps are now electric, and the proportion is steadily increasing, quite apart from extensions to the system which are always electric. The first discharge lamps installed in the provinces, we were informed, were those at Hull.

Dismissed Gas Men Given Employment

This and other incursions into what was once the sphere of the Gas Co. have necessitated a raising in the price of gas from 7d. to 7½d. per therm and reductions in its staff. The Electricity Department has, however, taken on such of the dismissed gas men as are suitable, and gives employment to ten men for every one so displaced.

The increase of the electrical staff during the last five years has been considerable, in spite of fewer men being engaged on generation. A good proportion of the new men are engineer-salesmen, canvassers and showroom assistants.

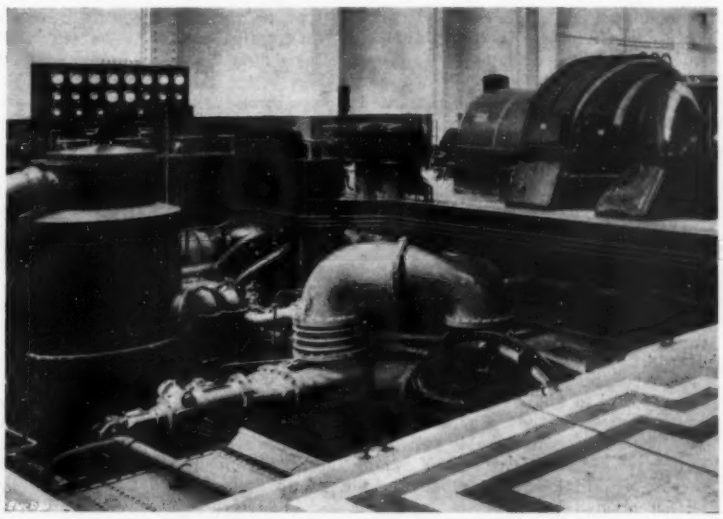
In addition, the work of changing over the large d.c. network to a.c. (to which £18,000 has been allocated this year) has necessitated the formation of a special distribution section to carry out the plans within some eight years by a process of "bites" into the old network from the centre and from the outside.

The arrangements made with the local contractors, by which the latter do all the wiring under the Department's various schemes, appear to be working satisfactorily. An important branch of this work is in connection with assisted wiring, about 2,500 residents having taken advantage last year of the facilities offered, bringing the total connections of this class up to nearly 20,000. In return the contractors are using the showrooms for the sale of apparatus and fittings under agreement.

The luncheon after the inauguration of the new set was held at the Guildhall and was prepared in the electric kitchen on the premises—one of the fifty or so commercial cooking installations in the city. Full advantage was taken of the menu card as a means of drawing attention to the merits of electricity for this purpose. Councillor F. Holmes (chairman, Electricity Committee), who presided, gave a brief history of the undertaking.

Sir John R. Brooke, C.B. (vice-chairman of the Electricity Commissioners), proposing the toast of the Hull Electricity Department, said that one of the reasons why the new set had been installed at Sculcoates was that the cost of producing electricity had been reduced by forty-seven per cent. in the last six years. In regard to selling price and service given the Commissioners recommended Hull as an example of what to do In six years the capital had been increased by seventy-five per cent. and the output by over one hundred per cent., while the price of electricity had gone down by ten per cent., with the result that the number of consumers had risen by three hundred per cent.

Ald. Benno Pearlmann (past chairman, Electricity Committee) referred to the increased assessment of the undertaking which last year paid £50,000 in rates compared with less than £10,000 in 1928-29. Councillor J. Robinson (deputy-chairman, Electricity Committee) proposed the health of the guests, for whom Mr. R. M. Longman (C.E.B.) responded.



The condenser plant serving the new turbo-alternator set

The kWh sold per £1 of capital expenditure has been suggested by the President of the I.E.E. as a measure of development. Recent figures for Hull in kWh per £1 for generation, distribution and total are: 1932-33, 96, 54, 32; 1933-34, 104, 56, 34; 1934-35, 118, 61, 37. In view of the undertaking's activity in rural areas these results appear to favour the President's conclusions.

Joint Control at Halifax

Decision to combine the Gas and Electricity Departments

AT a meeting of the Halifax Town Council on October 23rd a recommendation by the Finance Committee that the Gas and Electricity Committees should be merged into one was adopted. Consequently a Light, Heat and Power Committee is to be formed shortly to administer the two departments jointly. The reasons put forward by the proposers of this step were that by co-ordination gas and electricity could be supplied at lower rates due to economies in administration.

Alderman Gledhill moved that the minute should be referred back to the Finance Committee with a request that separate reports should be prepared by the two departments for the Committee's consideration. The decision had been made without reference to the Electricity and Gas Committees—a most unusual procedure. Many towns had already tried the arrangement and had found that it did not work satisfactorily. Councillor F. B. Smith, seconding the amendment, said that if, as had been suggested, there had been extravagance in publicity methods the matter was one for the whole Council to consider.

Councillor Mrs. Latham said that each department had sufficient work for a separate committee. If there was rivalry between them was that not desirable to keep them alive? Alderman Longbottom, who supported the minute, said (according to the *Halifax Guardian*) that there had been wasteful competition between the two departments. "The gas undertaking was doing a real service to the ratepayers, but every customer the electricity undertaking obtained was gained at the direct cost of the gas department . . . .Let us have a committee controlling that will see that neither takes advantage of the other."

Councillor Midgley, speaking against the proposal, also protested that the two departments had not been consulted in the matter. As to wasteful publicity, he said that the two departments, with a turnover of £383,000 per annum, spent only £2,570 on advertising, demonstrations and exhibitions. Any national advertiser would think himself fortunate to get such results with so small an outlay. Councillor Regan, who was in favour of the proposal, said that "the Gas Committee had made many attempts at compromise and had repeatedly tried to stop the waste of money. Not only would the proposal prevent the waste of money, but it would also prevent unhealthy competition and both departments would go on to greater progress by this."

Councillor Brenard, replying on behalf of the Finance Committee, showed that the Gas Committee was in favour of the suggested co-ordination. "The Electricity Committee was fostered and fathered by the Electricity Board, who would see to it that there was no diminution of their output of units, but nothing of the kind appertained to gas, although he maintained that gas was as necessary as electricity, and held that there was no need for a 'swan song' yet."

Ald. Gledhill's amendment was lost and the minutes were approved.

Wires and Cables. By H. R. Taunton

Some points from the new I.E.E. Regulations

AMONG the tables to the new edition of the I.E.E. Wiring Rules there is none to correspond with Table II in the ninth edition giving the comparison between the old and the new standard sizes of conductors. To us old stagers who can remember the wiring tables of thirty-five years ago the omission is a milestone of change. Evidently a new generation of wiremen has arisen who know nothing of 3/22's or 7/16's, and have no need to know of them, even as ancient history. There is an appropriate Latin tag, with *tempora* in it, but as I can't recall it at the moment let us pay the old gauge the tribute of a sigh, and pass on to the consideration of the new tables.

The simple Tables IV and V of the ninth edition have been expanded in the tenth to no fewer than eight new tables (Nos. 5 to 12) so as to cover the running of cables, on both a.c. and d.c. circuits, under various conditions and in every practical combination. Some of them, perhaps, are a little impractical; *e.g.*, cols. 6-8 of Table 7. The running of, say, ten 37/0.064's in one "conduit" can hardly be so frequent a requirement as to justify elaborate legislation for it.

The most striking feature of the new tables is the large reduction in the current rating permitted for the smaller sizes of cable, most commonly used in wiring, detailed in Table 5. In the case of 3/0.029 the reduction is more than a third, from 7.8 to 5 A. This will be rather upsetting to some contractors who have been accustomed to using this one size for every final sub-circuit, without worrying overmuch about the probable loading. The length in circuit for a one-volt drop is, of course, proportionately increased, but that will hardly console them.

The inclusion of 1/0.036, the first item in Table 5, is misleading. The information about its current rating and all the rest of it, however interesting, is useless, since Rule 306 expressly prohibits the use of anything smaller than 1/0.044. Clause A of Rule 302, stating that a diversity factor shall not be applied to final sub-circuits, requires amendment, as it now contradicts the new Clause D to Rule 4.

The new rule for permissible voltage drop is more stringent than the old (74 Aa). On a 230-V supply the maximum drop allowable at full load now works out, in round figures, at 5½ V, as against the former 8 V. This does not involve any great hardship, however, since in many cases the official sanction of a diversity factor will leave matters pretty much as they were so far as mains and sub-mains are concerned.

The Use and Abuse of Flex

Rule 307, dealing with flex, replaces 79-81 in the old rules. The only notable alteration is that what was formerly only a recommendation is now a rule: that flex for all portable fittings shall be of circular section, high insulation type. That is all to the good. Regulations for the use of flex can hardly be too stringent. It is a curious paradox that we take enormous pains to give mechanical protection, in the form of massive systems of steel conduits, to sturdy cables, and then allow them to tail off in comparatively lightly insulated flex, lying about the floor to kink and fray and be trodden under foot. It is unavoidable, of course, and the only thing to do is to keep the loose flex on a job down to the minimum and to regulate its use with every stringency.

Unfortunately, this is one of those matters in which the contractor often has to modify his orthodoxy to meet the prejudices of his customer. The layman likes plenty of flex, and he likes it flimsy. It is difficult to persuade him of the advantages of a heavily insulated but clumsy and expensive circular hawser for attachment, perhaps, to a delicate antique candlestick.

Clause B of Rule 307, for the same reason, is unpractical. Any flex attached to a standard is "subject to the risk of mechanical damage"; but the lady of the house will insist on its being covered in silk, to match her carpet or her complexion, and would merely deride the contractor who, quoting the rule, offered the alternatives of Rule 1313—say, jute braiding or wire armouring.

Distinctive Colours

In my last article I deprecated the new amendments to Rules 310 and 311, on the ground that they made optional the use of distinctive colours for cables. I was wrong in that, as was an earlier critic in these pages. The use of distinctive colours was not compulsory in the original text, and the effect of the words "if any" in the amendments is only to call attention to the option allowed by the wording of Rule 309: "*When* colours are used . . . those set out in Regulations 310 and 311 shall be used." The description of the colour system in these two rules occupies a little over a page; whereas it is possible to make out a complete table, clear and unambiguous, in eight short lines.

In the amendment to Rule 312, allowing "substantial mechanical clamps" instead of soldering sockets for cable ends, the crucial word, of course, is "substantial." An ordinary pinching-screw terminal is a mechanical clamp. It may be, though often it is not, "substantial," by mere mass of metal, and yet be unsatisfactory mechanically and electrically. It is the more likely to be unsatisfactory if cable ends are not soldered solid, as they need not always be (312B). On the other hand, if they are soldered solid, they might as well be soldered into a socket, and have done with it. On the whole, the amendment is a retrograde step, and most responsible contractors will prefer to work to the original rule, continuing their practice under Rule 92A of the ninth edition of the Regulations.

Rule 313 is an important one, dealing with joints; and here again mechanical connection is allowed—as it always has been—as an alternative to soldering. I hold the heretical opinion that a "dry" joint, properly made and insulated, is better, mechanically and electrically, than any soldered connector. The latter, however, is certainly a convenience, particularly for tees. It can readily be undone, and so provides for flexibility in a wiring system. Too many wiremen blindly make a fetish of the "loop-in" principle, when a judicious tee would sometimes be not merely more economical, but better, if only for the reason that it facilitates adaptation at some future date.

Clause E of Rule 313 repeats, word for word, surely needlessly, Clause G of the preceding rule, on the opposite page.

Adjacent Bell Systems

Rule 401B is interesting. Contractors have hitherto been careful not to run wiring for bells, signals, and the like, in the same conduit as wiring for lighting or power; in fact, the old Rule 91 expressly forbade it. On the other hand, it has been their common practice to mount bell-pushes on plates carrying lighting switches in a common box, without any special precautions to screen one from the other. That is now forbidden, while permission is given to run the two systems of wiring in a common conduit, provided that for bells conforms to all the rules governing general wiring. In other words, there is no objection, as has been commonly thought, to cables or accessories carrying different voltages being run or mounted together so long as they are safely insulated from each other.

Clause C of the same rule, repeating the old 122D, is one which has been broken in the past as often as it has been, accidentally, complied with. A lift shaft is a favourite medium for the running of main risers, and these are, quite commonly, plain p.i.l.c. cables. The objection to them is presumably the risk of their damage by a swaying cage, but that is surely very remote if the cables are installed with ordinary common sense.

Note that in Clause D the minimum radius to which v.i.r. cables may be bent is now double what it formerly was, under the old Rule 89Ba, both for unarmoured and metal-sheathed types. In Clause E the radius for paper cables has also been increased. The previous minima were certainly too small.

This picture illustrates a good example of industrial lighting. It shows a cutting-out room in a Gloucester shirt factory equipped with high-intensity illumination employing G.E.C. fittings

Hot Water for Flats. By C. F. Whitehead

A scheme which offers a solution to some objections and difficulties

THE supply of hot water for large blocks of residential flats has not received the attention that it deserves from the electrical industry. Because of the outstanding space difficulty and the high cost of building chimney stacks the architect and builder are now nearly always prepared to consider electric heating in the first place. This means much to every salesman and offers much to electrical enterprise.

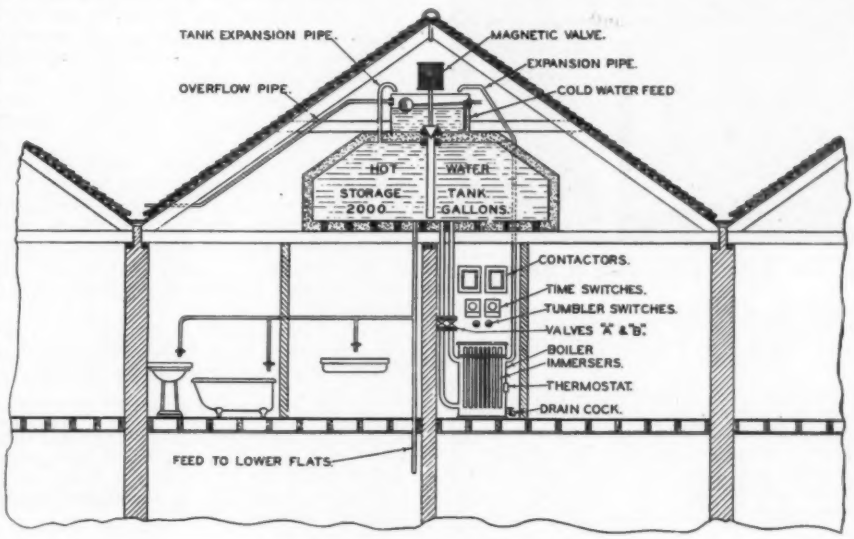
But that which gives the electrical man the first pull also presents to him the first major difficulty. I refer to the space question. On this score individual self-contained water heaters for supplying the flats separately are not welcomed, and it is essential to treat the problem as a bulk supply one from the start. Bulk supply, however, is often defeated by normal tariffs and the battle has to be fought on the night-supply field, where the undertaking can, with profit to itself, use favourable weapons in the form of lower tariffs.

Early in considering night heating another big difficulty is met—basements for storage tanks and boilers are disliked as "costly unprofitable space." So I therefore suggest the following scheme which provides for storage tanks in the roofs as a practical solution to the difficulties.

The idea is to make the greatest possible use of the normally waste spaces in the roofs by constructing the tank or group of tanks to the roof shape, distributing the weight over as large an area as possible, and to feed this at night only on the external circulation principle, with the circulating heater located under the storage tank in a convenient cupboard on the top floor.

The current is time-switch controlled, and the contactors governing the supply circuit are electrically interlocked with the magnetically operated valve controlling the cold water inlet to the storage tank from the ball valve tank, so that during the day when the electricity supply is off the storage tank hot-water level is gradually lowered until the time switch operates at night when the water system is filled again.

Why not exclude the circulator and make the roof tank a self-contained system? True, this self-contained system would give the same broad result, but not so economically, for it would be necessary to keep the immersion heaters at the bottom of the tank always covered with water, so reducing the effective volume of the tank and increasing the thermal losses by heating that water which is not available for use. Further, if the push-through system without daytime boosts were used, this would result in the water being merely luke-warm at the end of the day. Then there would be the added inconvenience to tenants of having to empty the storage tank completely at times for descaling the tank interior equipment.



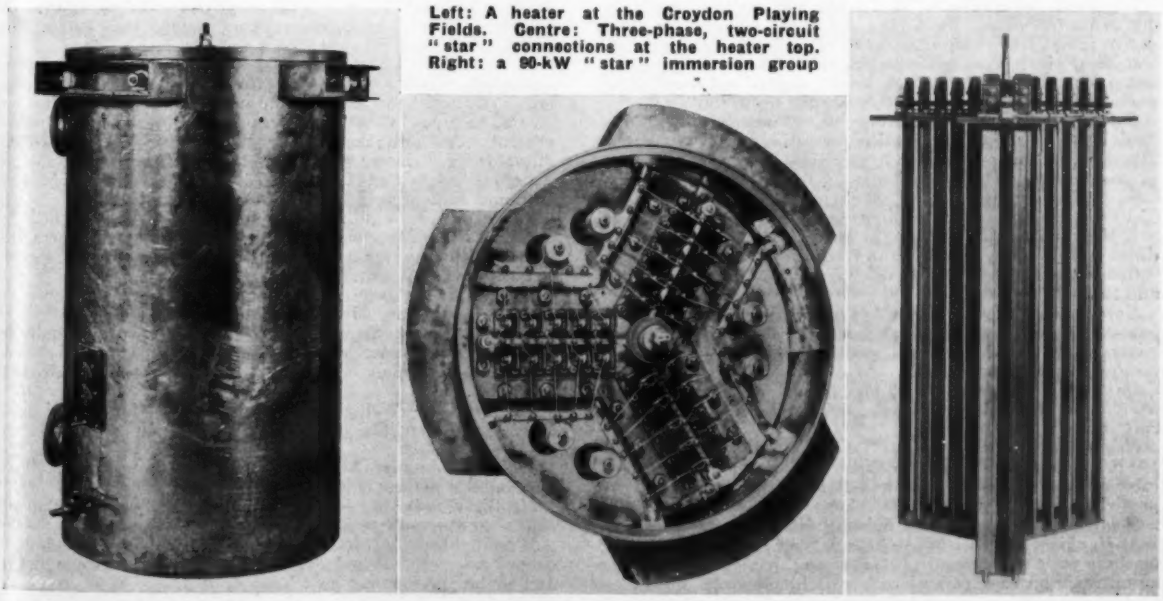
A three-phase bulk hot-water system for flats

With the scheme in question valves A and B shown in the accompanying drawing can be closed, the small quantity of water drawn off from the heating unit and the immersers withdrawn without inconvenience to the tenants who are still served by the storage tank. The expansion pipe provides against pressure owing to inadvertent non-opening of the valves and/or to the thermostat sticking.

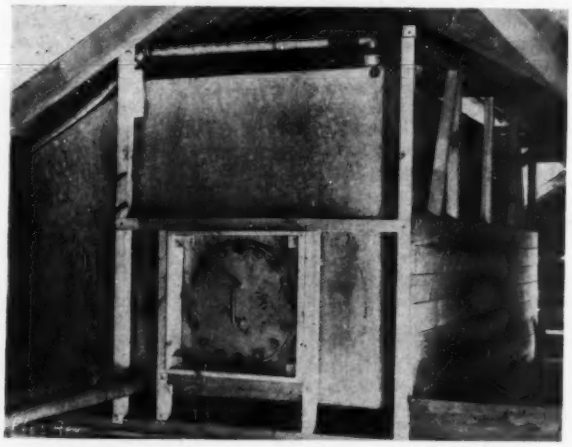
I estimate that on such a system for, say, a block of fifty flats "uncontrolled" hot water supply could be offered at 1s. 10d. per week per tenant, based on electricity at 0.25d. per kWh. The storage tank capacity should be about 2,000 gal. and the set temperature about 180 deg. F. The 40 gal. of water available at this temperature should amply provide for all the requirements of each tenant, who would add cold water to his liking, and such a supply would have a favourable diversity factor.

One vital necessity for the success of such a scheme is a circulating and heating equipment with the largest possible heat emission area and the smallest possible water capacity, so as to reduce the quantity of "dead" water below the outlet level of the storage tank. To this end I suggest that the heaters recently installed in two new pavilions at the Purley Way playing field of the Croydon Corporation are the most suitable yet devised for large-scale water heating of this kind.

Left: A heater at the Croydon Playing Fields. Centre: Three-phase, two-circuit "star" connections at the heater top. Right: a 90-kW "star" immersion group



The problem set was to provide hot water for two 1,000-gal. baths in each pavilion by which "communal" baths could be offered at 1d. per person, in addition to spray baths and wash basins, and this has been solved very satisfactorily with electricity at 0.33d. per kWh. (Since this estimate was given the general night tariff at Croydon has been reduced to 0.25d. per kWh.) The scheme adopted embraces for each pavilion



A roof-storage tank at Purley Way prior to lagging

a 90-kW boiler feeding a 1,600-gal. storage tank in the roof, the scheme being designed to permit the storage water temperature to be raised from cold to 180 deg. F. in about eight hours.

Each heater is balanced on a three-phase supply, and to facilitate connections the theoretically orthodox star connection is interpreted in material form so that from a Y-shaped frame are suspended thirty 3-kW immersion heaters—ten in each arm. The immersers are arranged in two balanced circuits, there being two rows in each arm. The rows are connected separately to outside phase bus-bars and commonly connected to a central neutral bus-bar. Now to limit the water capacity of the boiler as much as possible the container closely conforms to the arrangement of the elements, so that actually we have a "star" cross-section boiler with star-arranged group element connections to a three-phase star-connected supply.

The container is built up of ½-in. thick steel plate in sections welded together electrically. It measures 3 ft. 3½ in. deep from cover to bottom, and each arm is 10¾ in. long from the tank centre and 5 in. wide. Without the elements it will hold 20 gal. of water. At the top the container has a ⅜ in. by 1½ in. flange fitted with ⅜-in. studs to receive and secure the door. This is made of ¼-in. gunmetal, is ribbed for strength and has suitably located ports for carrying the immersers. The whole unit so far described is set in a cylindrical outer casing 2 ft. 4½ in. in diameter and 4 ft. deep.

The space between the container and the outer casing is filled in with cork heat insulation, and because of the peculiar construction of the container in relation to the shell this insulation is particularly generous. Normally for this loading the heater proper would be about the size of this container, which has a capacity of about 75 gal. Thus the quantity of "dead" water saved by the "star" construction, with its attendant losses, is about 55 gal.

While there is final hand control for the equipment, it is normally time-switch controlled for the limits of night loading, with automatic thermostat control within those limits. The two heating circuits are separately controlled, for which purpose there are two time switches, one acting as stand-by to the other, and each with two sets of contacts. Two thermostats, one as a stand-by to the other, are located in one container arm.

Each of the circuits is operated by a contactor unit, and the appropriate hand switch, time switch contacts and the thermostat are connected in series with the contactor energising coils.

The water control is definitely by hand, primarily because there is no room for a ball-valve cold feed tank; secondly, if the cold-water valve were left open cold water would be drawn from the bottom of the tank; and, thirdly, a magnetically operated valve is unnecessary as a pavilion attendant is always on duty.

Flameproof Mining Gear

DURING the three months ended September 30th last the Mines Department granted certificates for flameproof enclosure in respect of the following electrical apparatus:—

Anderson, Boyes & Co., Ltd.—100-A plug-and-socket connector with three alternative socket castings; modified air-break gate-end circuit-breaker.

A. Barclay, Sons & Co., Ltd.—Storage battery container.

Belmos Co.—100-A a.c. and d.c. distribution panels.

British Jeffery-Diamond, Ltd.—35-h.p. coalcutter motor.

British Thomson-Houston Co., Ltd.—Small size slip-ring enclosure without short-circuiting gear; air-break cam master controller; auxiliary lighting transformer unit; controller instrument with moving-iron interior; projecting-type instrument for moving-iron ammeter or voltmeter movements.

Crompton Parkinson, Ltd.—Slip-ring enclosure for types MM191-292 induction motors.

Electrical Apparatus Co., Ltd.—Haulage control panel; inductor control panel; 100-A plug-and-socket modified for alternative cable glands and attachment of cable by clamping nuts instead of pinch screws; air-break gate-end box with gunmetal instead of mild-steel interlock lever; single- and two-button push-button boxes for a.c. or d.c. circuits up to 650 V.

Electrical Power Engineering Co. (Birmingham), Ltd.—2.5-6 h.p. and 1.5-4 h.p. continuous rating, 570-1,440 r.p.m. 110-530-V d.c. motors, also with variations in rating, reduction in core length and alternative cable box; 2-5 h.p. and 0.5-2 h.p., continuous rating, 600-1,500 r.p.m., two- and three-phase, 25-100 cycles, up to 600-V, squirrel-cage motors, also variations.

E.M.B. Co., Ltd.—Reversing and non-reversing air-break drum controllers, also stator and rotor types.

General Electric Co., Ltd.—15-A triple-pole air-break switch and fuse box.

Hardypick, Ltd.—"Geared" type coal-drilling machine; gate-end transformer and switch box and tubular motor generator gate-end box, both with modified alternative incoming gland for c.t.s. cable.

Harland Engineering Co., Ltd.—35-h.p., continuous rating, 600 r.p.m., three-phase, 50-cycle, 500-V slip-ring motor; slip-ring unit.

Heyes & Co., Ltd.—"Wigan" well-glass lighting fitting for 100-150-W lamps having a modified joint box with additional cable-sealing boxes; 60-W well-glass fitting similarly improved; "Wigan" magneto telephone.

Holophane, Ltd.—Pendant lighting fitting for 200-W lamps.

A. Hopkinson & Co., Ltd.—"Black Star Fifty" coal-cutting machine with remote control; "Pikrose" haulage unit having an oil reservoir cast integral with switch end-cover.

Lancashire Dynamo & Crypto, Ltd.—Cable attachments, covering additional information as to type of conduit; petrol pump motors, supplement to previous certificate covering variations in rating.

Laurence, Scott and Electromotors, Ltd.—2.25 h.p., continuous rating, 460-480 V, 1,850 r.p.m., d.c. motor with external fan; slip-ring enclosure for 6½ in. dia. rings.

M. & C. Switchgear, Ltd.—Draw-out oil circuit-breakers.

Macintosh Cable Co., Ltd.—Well-glass lighting fitting for 60-W lamps; bulkhead lighting fitting for 60-100-W lamps.

Mather & Platt, Ltd.—15-h.p., 1,000 r.p.m. d.c. motor; nine sizes of squirrel-cage motors from 1.5 h.p. to 22 h.p.; slip-ring enclosures with and without short-circuiting gear and with max. ratings of 450 A and 600 A.

Mavor & Coulson, Ltd.—Combined conveyor motor and starter, with 100-A electrically interlocked B.S. plug and socket; air-break starters with auxiliary switches instead of remote control; 5-h.p., intermittent rating, three-phase, 50-cycles, 500-V squirrel-cage loader motor.

Metropolitan-Vickers Electrical Co., Ltd.—Air-break drum controllers, various ratings; squirrel-cage motors; projecting-type instrument for moving-iron ammeter or voltmeter movements, also substitution of moving-coil interior; motor-generator drill unit; drill and lighting control panel; draw-out, pillar-type switchgear up to 250 A, 3,300 V.

Revo Electric Co., Ltd.—100-W well-glass lighting fittings with and without an internal contact-breaking device.

A. Reyrolle & Co., Ltd.—Modified coal-face lighting fitting; 200-A bolted cable coupling with cable-sealing chambers integral with the main chamber; 100-A B.S. plug-and-socket connector with improved barrel.

Switchgear & Cowans, Ltd.—Plug-and-socket connector with altered cable gland; flit plug cable coupler.

Uskside Engineering Co., Ltd.—Coalcutter unit; squirrel-cage conveyor motor with an electrically interlocked 100-A B.S. plug-and-socket connector mounted on the non-driving end-cover.

Veritys, Ltd.—Well-glass lighting fittings for 100-W and 60-W lamps, modified to provide connection chamber and cable sealing box.

Walsall Conduits, Ltd.—Four-way, cast-iron conduit box, also smaller malleable-iron type.

M. W. Woods, Ltd.—D.c. motor, also with substitution of single- or three-phase interior.

Wright Electric Motors (Halifax), Ltd.—Single or endless drum haulage motor and switch unit, with squirrel-cage motor and air-break reversing switch.

The Changing of Apparatus.

By D. P. Sayers, B.Sc., A.M.I.E.E.

Problems encountered in a large a.c. to d.c. conversion

IN the Northern Ireland change-over scheme, the preliminary organisation of which was described in last week's ELECTRICAL REVIEW, the apparatus replaced included 350 motors of ordinary types, 770 radio sets, 300 miscellaneous appliances and 10,000 meters.

The "consumers visited" sheets (described in my earlier article), after scrutiny in head office, were placed in "Action" or "No action" files, the former including all cases where motors, radio sets, or other apparatus were listed for changing. All "Action" apparatus was then tabulated on tracings, with columns left for order numbers and delivery dates of the replacements, and prints were issued to the district stores and wiremen.

The d.c. systems had operated nominally at 220 V, but in practice the voltage varied from 250 to 180, depending on the distance from the generating station. As the standard declared voltage on the Board's a.c. systems is 230 V, lamps and ordinary heating apparatus were not ordinarily changed.

The ordering and supply of a.c. meters presented little difficulty, as the requirements could be estimated beforehand and large quantities of all standard types and sizes were normally stocked by the Board. One difficulty, however, arose from the coincidence of change-over with the abolition of the old tariffs; in a large number of cases consumers could not make up their minds which of the available tariffs they wished to adopt, and this governed the type of meter. Where a consumer elected to go on to the two-part tariff with prepayment meter, the meter had to be specially calibrated. In order not to delay the general progress of the change-over it was decided to install flat-rate meters wherever possible and to have an understanding with consumers that the meters would be altered later if required. Many consumers had paid previously on a weekly rate of so much per light installed and had no meters. As the Board did not intend to continue this form of charging, meters had to be installed in all these premises, and sometimes strong opposition from the consumers had to be tactfully handled.

However, the most difficult part of the meter business was the routine of hanging so large a number of meters under rush conditions and retaining correct records for accounting purposes, the men being accustomed to such work. The d.c. meters were of all patterns, including the mercury or electrolytic type, the reading of which was destroyed immediately the meter was disturbed.

Prior to each change-over a list of the consumers' names and addresses was prepared in the district stores, with the types and sizes of meters required for each, and suitable a.c. meters were selected. A label was then made out with the name and address of each consumer and tied on to the a.c. meter, the registered number of which was marked on the label and on the list. The meters thus selected were arranged in street order and on the day of change-over were taken out in small batches in vans and handcarts. The wireman responsible for the change first made a careful note of the number and index reading of the d.c. meter on the back of the label, which he then removed from the a.c. meter and tied on to the d.c. meter which was then returned to store. In the stores the d.c. particulars were copied from the label, thus providing all the information required for completing the meter-change dockets for the meter and accounts departments.

Replacement of Motors

As soon as a general idea of the requirements had been obtained an inquiry was issued to the principal motor manufacturers for representative types and sizes of a.c. motors, as a result of which keen prices were obtained and a special discount was secured on quantity. All the standard motors were ordered from one manufacturer, who quickly became conversant with the requirements.

In placing orders for the individual motors sufficient detailed information was collected from site and transmitted to the manufacturer. The replaced d.c. motors were often worked at a considerable overload, and the speed frequently varied greatly from that given on the rating plate. It was thus found advisable to check the d.c.-motor speeds.

The type of a.c. motor selected was largely influenced by the use of overhead distributors of relatively small copper section. Consequently it was important to avoid heavy single-phase loads, but at the same time this type of distribution facilitated the provision of three-phase services where desired.

Three-phase slip-ring motors were used for all requirements over 5 h.p.; the cost was relatively heavy, due largely to the starting gear which frequently cost almost as much as the motor itself. Three-phase squirrel-cage motors were used up to 5 h.p., with direct-on starting up to 2 h.p. and star-delta starting over 2 h.p.; similar motors were also used in a few cases for fractional h.p. requirements where a high starting torque was not essential and where the saving in motor cost was sufficient to offset the extra cost of three-phase wiring. Single-phase repulsion-induction motors with direct-on starters were employed up to 3 h.p. where high starting torques were essential. Single-phase induction motors with centrifugal clutch and split-phase starting were only used where the motor would definitely start at no-load.

Where the conditions did not justify the cost of a repulsion-induction motor, a three-phase squirrel-cage machine was generally chosen in preference to a single-phase induction motor where three-phase mains were available. The following representative figures illustrate the position:—

Type.	P.F. %	Efficiency. %	Price.	Starting torque %	Starting current %
Three-phase squirrel-cage	75	75	£4 7 0	100	300
Single-phase induction	68	60	£5 11 6	50	500
Single-phase repulsion-induction	64	71	£7 1 0	300	200

Very few truly variable-speed motors were encountered, and these were replaced by one or other of the following:—Three-phase slip-ring motors with continuously rated rings and drum-type rotor-resistance controllers; variable-speed commutator motors; two- or three-speed induction motors of the pole-changing type; motor-generator sets.

Domestic Appliances and Radio Sets

The change-over involved 180 vacuum cleaners, the majority of which contained universal motors. A large proportion, however, were rated at 200 to 220 V, and as most of the manufacturers were not prepared to guarantee these when worked on 230 V a.c. several were removed to avoid disputes with consumers. The manufacturers, on receiving the machines, almost always found other repairs or replacements to be necessary which were not incidental to the change-over, and it was not always easy to persuade the consumer to bear the extra cost.

The changing of radio sets was undoubtedly the most tedious and thankless part of the change-over. At the outset it was decided that the standard method of conversion would be the fitting of a rectifier, but that where some other method proved more attractive to a consumer it could be adopted, provided that the cost to the undertaker did not exceed that of a rectifier. To suit all the different types of set encountered various sizes of rectifiers were required, ranging in output from 30 mA to 350 mA.

About 80 per cent. of all the sets encountered were battery sets operated from the d.c. mains by h.t. eliminators. Rectifiers were fitted in all these cases, mainly of the 30-mA size with intermediate tappings of 10 and 20 mA. Mains-operated speakers were frequently used in conjunction with battery sets; in such cases a single rectifier of 80 to 100 mA was fitted to operate both set and speaker.

The current consumption of all-mains sets was found to vary from 150 mA to 350 mA or more, according to the make of set and type of valves in use. The actual current was measured in practically all cases and rectifiers fitted to suit. A rectifier was fitted to radiograms, and in many cases the motor was found to be universal; when otherwise the d.c. motor was replaced.

A large number of American sets had to be dealt with, the consumption of which is 500 mA or more. The fitting of rectifiers was impracticable, as, apart from their cost, such rectifiers are bulky and objectionable to consumers. The method adopted in such cases was to negotiate an exchange of sets with dealers, or to make an equivalent cash allowance.

The rectifiers proved generally satisfactory but a certain amount of trouble was experienced with the larger sizes. More often than not, however, consumers blamed rectifiers for many faults which were found to be due to trivial defects in the set itself.

Some consumers strenuously opposed the fitting of the "black box" on the grounds of unsightliness or lack of portability. In such cases an exchange was negotiated with a dealer or the consumer was offered a cash allowance equivalent to the cost of a rectifier. In the later stages of the change-over the second arrangement was encouraged, and in one town all the consumers were circularised beforehand and given the option of a rectifier or an equivalent cash allowance. Approximately half of the consumers elected to take rectifiers.

There is no doubt that the cash allowance is the most economical and satisfactory method from the undertaker's point of view, as the payment of the amount concludes the matter, and the trouble and expense of fitting the rectifier and perhaps of many subsequent visits to correct real or fancied faults is

avoided. Moreover, the consumer usually decides to spend a little more out of his own pocket and exchange his old set for a new model and he then obtains much more satisfaction in the long run.

The cash allowance was never paid direct to the consumer but was placed to his credit with any recognised dealer selected by him. In all dealings with wireless equipment it was found essential to give the most impartial and equal treatment possible to all consumers alike, as news travelled very quickly and there were at least a few consumers who seemed to regard the change-over as a means of obtaining brand-new sets for old ones at the undertaker's expense.

The treatment adopted for various special apparatus was: In bacon slicers, coffee grinders, sausage machines, cash registers and refrigerators the motor is usually built in as an integral part of the machine. The question of replacement was always referred to the original manufacturers, and usually the only satisfactory arrangement was the purchase of a new a.c. machine with an allowance on the return of the old d.c. machine. This method avoided any difficulty about the guarantee and service agreement under which most of these machines are supplied.

Dental apparatus was referred to the original manufacturers. Sometimes the quotations for replacement appeared prohibitive and the d.c. motors were rewound at a reasonable cost by a specialist firm. In one or two instances the d.c. equipment was not altered but fitted with a rectifier.

The motors of church organs usually formed an integral part of the blower, and the replacement was referred to the original suppliers; motor speed is critical and in some instances noiseless machines were essential.

Toilet and Electro-medical Apparatus

Hair dryers and wavers were usually returned to the makers to have the motors replaced, though some types are universal. Some of these machines include heating elements, and as the temperature is critical it is important that the elements are wound for the correct voltage. The motors of hair clippers are usually universal. The solenoids of vibro-massage appliances work satisfactorily on a.c. without alteration. Infra-red radiant heat lamps are universal.

Ultra-violet ray lamps require extremely careful handling. Two types were dealt with: Type 1. Fitted with atmospheric burners as manufactured by Kelvin, Bottomley & Baird. A small heater coil is used for starting the lamp, the starting current of about 5 A falling to 2 A when the lamp is working. For a.c. working a rectifier of large output is required, and it is essential that the output be thoroughly smoothed. The actual starting and running currents are important as they govern the length of the arc; in each case this was carefully measured and adjusted to the maker's satisfaction. Type 2. Vacuum burners of the "Hanovia" type, with which a rectifier is impracticable, as the starting current is of the order of 10 to 12 A. The manufacturers are, however, able to remodel the lamp to incorporate a three-pole burner with phase-shifting device which renders the lamp suitable for operating direct from the a.c. supply. This method was very satisfactory, particularly as the new burners were installed and maintained free for one year by the suppliers or agents.

A few mercury-vapour photographic enlargers were encountered, and the action was generally similar to the second type of ultra-violet ray lamps. Hand drills for garages were usually returned to the makers for rewinding or new drills were supplied, the old drills being returned in part payment. With cylinder borers, as speed is critical for satisfactory operation, the driving motor on the boring bar was replaced by a motor of the same manufacture and speed as the original d.c. machine.

For charging batteries, rectifiers or new motor-generators were supplied. Consumers usually make extravagant demands regarding the range of charging equipment, and firm handling is necessary. Magneto magnetisers presented a difficult problem as the output required may be 12 A or more at full voltage for very brief periods. In the few cases encountered the consumers were provided with small d.c. generators which they worked when required from the garage countershaft.

In the more modern picture theatres where the equipment had been supplied as a complete outfit by one manufacturer, under a service agreement, the alterations were entrusted to the manufacturer. In other cases the installation was dealt with as follows: As a general rule arcs were run direct from the d.c. supply through a resistance, and on change-over a motor-generator set was installed. On the average arc the working voltage is about 45 and the current ranges from 15 to 25 A. The change-over of projection motors was referred to the original manufacturer, as exact speed is critical.

Sound amplifiers are usually constructed for working direct on 230 V a.c. and are fitted with a rotary convertor for working on d.c. supply: all that was necessary was to cut out the rotary convertor. Loud speakers required rectifiers, but sound heads are usually supplied by batteries and no action was necessary.

Approximately 4,300 consumers were changed over in seven months and about 1,300 new consumers were connected during the reconstruction.

Three-phase Corona Losses

AMONG the many interesting tests carried out by Mr. J. S. Carroll at the Ryan High-voltage Laboratory of Stanford University, U.S.A., to determine the corona losses from bare conductors, are his latest investigations at 230 kV of a three-phase system with one conductor earthed. The corona losses under this condition of operation, which may occur on a transmission system not having the neutral solidly earthed, are shown to be considerably increased over the more usual operation with all three conductors at the same voltage.

Curve No.	Condition.	Barom in. Hg.	% Rel. Humid.	Temp. Air.	Deg. F. Cable.
1	After petrol, soal and water washing	30.16	46	60.5	68.0
2	After 1.25 in. rain	30.20	62	61.8	70.0
3	After 1.25 in. rain	30.20	60	61.0	68.0

This increase in corona loss is found to give less satisfactory performance on systems using a Petersen coil, or other form of reactor, connected between neutral and earth on the star side of the power transformer. Such types of earthing depend for their successful operation on the neutralisation of the capacity fault currents by the inductive current flowing through the earthing reactor, the two currents being approximately 180 deg. out of phase.* Unduly high corona losses, therefore, cause a large in-phase component of the current, and decrease this phase difference with a consequent detrimental effect on the arcing fault.

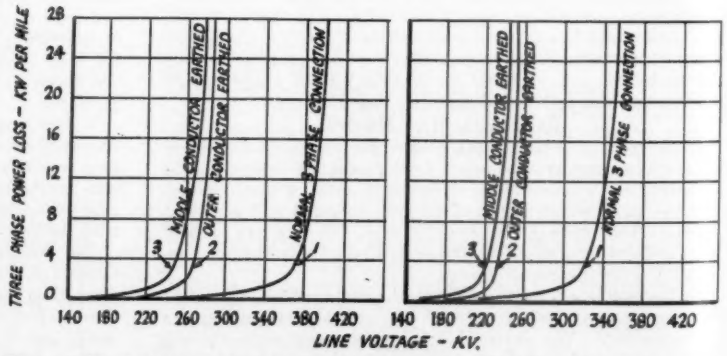


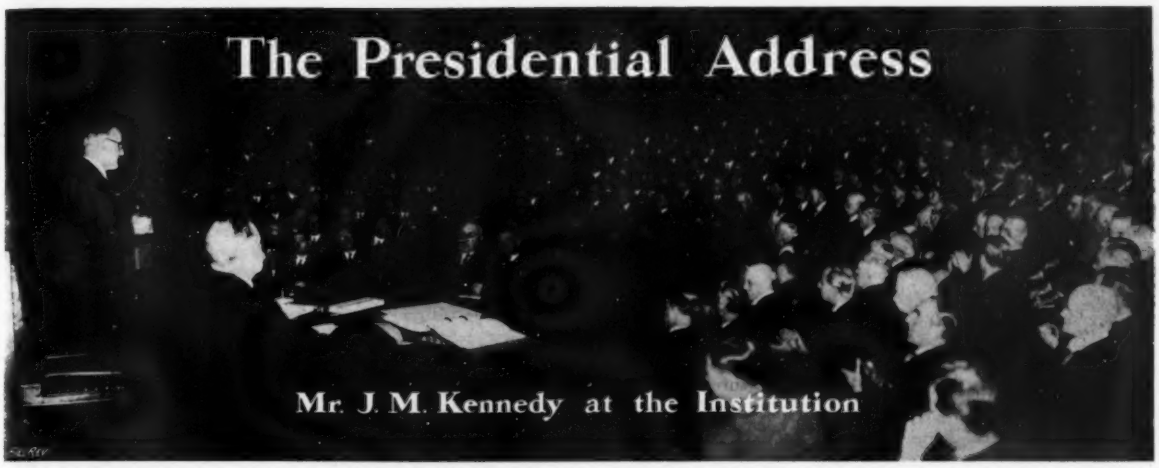
Fig. 1.—Three-phase corona loss curves for a 1.1 in. segmental hollow copper conductor, and (fig. 2) the same at 4,000 ft. elevation

The losses were measured on a hollow conductor composed of interlocking segments having a total cross-sectional area of 500,000 circular mils (approximately 0.4 sq. in.) manufactured by the General Cable Corporation. Before carrying out the tests the conductor was thoroughly washed inside and out with petrol, and then washed outside with soap and water and with clear water. The accompanying curves (reproduced by courtesy of *Electrical Engineering*) were obtained after the cable had weathered for approximately one month, during which time there had been some rain. Fig. 1 gives the losses with an earthed middle and outer conductor, and also for normal three-phase voltage under the following conditions:—

The increase in loss under the earthed condition is very great, especially with the middle conductor earthed. These measurements were made at practically sea level, and since transmission lines often go to much higher levels, the curves in fig. 2 were computed for an elevation of 4,000 ft. It should be pointed out that with the smooth surface of a segmental cable the losses are very much lower than for a cable with round wires on the surface. The diameter of the segmental cable tested was 1.1 inch, and to obtain the same corona loss on a stranded cable a diameter of approximately 1.3 in. would be required.

*See the ELECTRICAL REVIEW, August 11th, 1933, p. 180.

The Presidential Address



Mr. J. M. Kennedy at the Institution

THE present position and future prospects of the electricity supply industry and its influence upon many phases of the national life were the subjects covered by Mr. J. M. Kennedy, O.B.E., in the address which he delivered as President of the Institution of Electrical Engineers on October 24th.

The pollution of the atmosphere by industrial smoke and grime; the replacement of human labour by machinery; and the overcrowding of the population into industrial areas were three directions in which electricity was destined to play an increasingly important part.

When it was possible to say that in electricity there was available a means of eliminating smoke without addition to the industrial or household budget we could hope for effective legislation on the question of smoke abatement. Even now the electrification of all suburban and many main railway lines was profitable, but any reduction in the cost of energy would accelerate developments, while in electric trolley and battery vehicles there were opportunities for improving the amenities

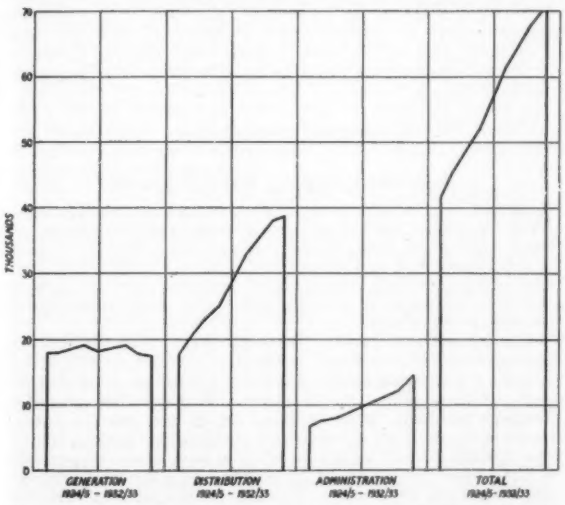


Fig. 1.—Staff and workmen in authorised electricity supply undertakings

of the streets and diminishing the amount of petrol imported to the benefit of the coal industry.

Surveying the unemployment problem and the remedial means which had been suggested, Mr. Kennedy claimed that the electrical industry as a whole had helped to stem the rising tide of unemployment during the last ten years. In that period the total number employed in manufacturing, contracting and supply had increased from about 200,000 to 330,000. In the supply section the increase had been more rapid than in other branches. Fig. 1 showed the numbers employed in the three main sections of the supply industry during the last eight years, indicating that while on the generation side a level had been maintained, on the distribution and administration sides the numbers had been more than doubled. This pointed to the need for training the staffs of generating stations for transfer to distribution as opportunities arose.

Any speeding up in the development of supply would bring in its train a large amount of work for the manufacturing and contracting branches. Similarly a comprehensive programme of railway electrification would employ over 100,000 men directly or indirectly—which would be no mean contribution to the solution of unemployment. It must be admitted that there would be a reduction in the number of permanent railway employés for any particular programme of train mileage, but this would be counterbalanced to a large extent by the additional personnel which would be necessitated by the potential and probable increase in services and the men required on electrical works.

The President did not think that the ultimate effect of electrification would be a reduction in the quantity of coal required. Electricity would be cheapened, leading to more extensive use all round. Moreover, as an electrification programme would be spread over ten or fifteen years he did not consider that the ultimate results on employment or coal consumption need cause any apprehension and it would certainly help employment during the constructional period.

The electricity supply industry had achieved a great deal during the past decade, but the reduction in the revenue per kWh sold from 1.85d. to 1.37d. had only been possible by the decrease in the total cost of generation (including capital charges) from 0.97d. to 0.52d. per kWh sold and a small reduction in the amount set aside for rates. There had been no reduction in the cost per unit of distribution.

Since 1930 there had been a reduction of 21 per cent. in the amount of spare plant, setting free about one million kW of plant which would otherwise have been kept in reserve. At only £10 per kW (net) it appeared that a saving of £10 million had already been brought about—more than one-third of the whole cost of the grid. With the further reduction of spare plant to, say, 20 per cent. of the aggregate maximum demand, the net value of the plant freed for commercial operation would be in excess of the whole cost of the grid and considerable extra economies would result from the co-ordinated control of all generating resources.

It would be seen from fig. 2 that practically half of the total revenue was absorbed by capital charges and a preponderating part by distribution costs. The annual turnover of the industry amounted to only 15 per cent. of the total capital expenditure as compared with 30 per cent. for the gas industry and 45 per cent. for the Post Office. A reduction of one per cent. in capital charges could reduce the average revenue per kWh by 7 per cent.

Cheapening Distribution

But any possible reduction in this direction must be small compared with what had already been achieved. To maintain or accelerate progress, therefore, we must look to the distribution side to effect the necessary economies.

Possible improvements in distribution were:—(1) A reduction in capital expenditure by co-operation between adjoining areas; (2) a reduction in capital expenditure by economies in design and construction; (3) a reduction in the percentage relationship of annual distribution costs to capital expenditure; and (4) an increase in kWh sold per £ of capital expenditure.

As regarded the first point, economy could be effected by adjoining undertakings co-operating to supply streets or villages near the boundary, especially where the magnitude of the demand warranted a duplicate supply. As to the second point a freer exchange of ideas and experiences between undertakings was desirable, in which direction the Transmission Section should be of material assistance. The standardisation of apparatus—especially cookers—would also reduce manufacturing costs.

Fig. 3 showed the straight-line relationship between annual distribution costs and capital expenditure. The cost of administration should be overhauled to ensure that all possible economies were effected. Tariffs should be reduced as far as possible to eliminate surplus profits and thus obviate unnecessarily high assessments for income tax and local rates.

But probably the most important of the four points was the

last. Pointing out that in the last ten years the kWh sold per £ of capital expenditure had fallen and that there had been an increase—from 0.76d. to 0.77d. per kWh—in distribution costs, the President questioned the excuse that it was due to the spreading of supplies into rural areas. As to the other contention that it was due to the supplying of many more consumers, with low incomes he suggested that this would be remedied by the institution of attractive tariffs, for the present average consumption per consumer for lighting, heating and cooking was only half of the potential requirements of the smallest household for lighting and cooking only. He declined to believe that the best had been achieved; most of the advance was due to the new consumers in the million new houses (with other accompanying premises) which had been built during the last five years. The real inroad into the potential consumers who existed five years ago had only been at the rate of about 5 per cent. per annum. Therefore, although the Central Board's estimates of sales had been exceeded and there was no apprehension as to the financial result, there was no room for complacency if the industry was to be of real help in solving the national problems to which he had referred. The nearer we approached to saturation the greater was the effort needed to maintain the rate of progress. Mr. Kennedy said that due credit should be given to the gas industry for its effective publicity, its self-regulating oven (an example which our manufacturers were now somewhat tardily following), and its simple tariffs.

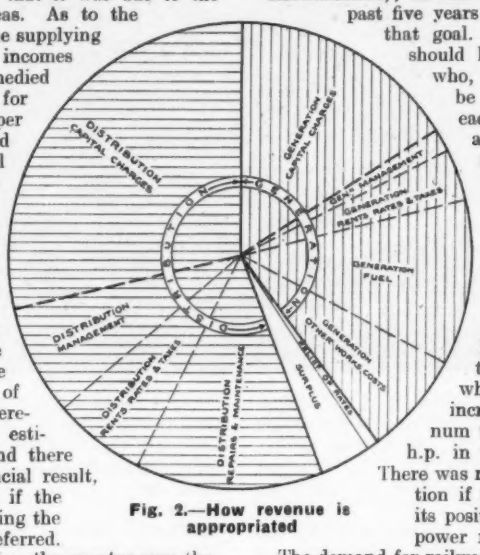


Fig. 2.—How revenue is appropriated

Apart from gas, the slow combustion stove was a serious rival but there was no reason why the electrical industry, adopting the heat-storage type of cooker, should not equally guarantee an annual maximum running cost.

Causes of complaint should be removed such as those which arose from the neglect of consumers' requirements, bad voltage regulation, excessive charges for service cables and the complexity of forms which the consumer sometimes had to fill in. The "watertight compartment" form of organisation was to be condemned from the consumer's point of view.

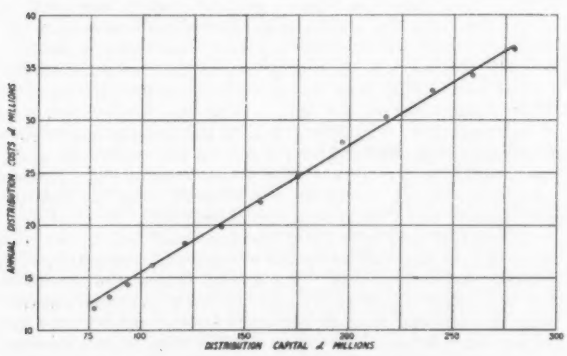


Fig. 3.—The relationship between annual distribution costs and distribution capital

In order that the problems of distribution might be tackled on a scientific basis, it was essential to understand the requirements and to possess the necessary data in respect of each area, to enable a suitable plan of development to be prepared. In this connection the President commended the E.A.W.'s report on an investigation into the needs of working class houses. The poorer people could only be induced to change over to electricity if the cost were not more, and preferably less, than that of the equivalent present expenditure.

For the successful carrying on of any business on a large scale investigation and research into the commercial and psychological problems were just as necessary as into purely technical difficulties. In many cases the wide variations in prices and the rate of development were governed more by policy than by cost, and the best way of overcoming those difficulties was to establish a measure of co-ordination in policy over wide areas.

The longer action was delayed the less rapid would be the reduction in the cost of electricity and the rate of development generally.

In 1926 Sir John Snell, as president of the Engineering Section of the British Association, gave as an ideal to be aimed at a total of 47,000 million kWh a year (20,000 for domestic supplies, 20,000 for industrial power, and 7,000 for railway electrification); at the average rate of progress during the past five years we were still twenty-five years from that goal. But long before then the industry should have ten million domestic consumers who, on Sir John Snell's estimate, would be consuming only 2,000 kWh a year each—a figure which would easily be accounted for by cooking and lighting alone. But with the proper development of water heating 58,000 million kWh a year could be disposed of while there was also a potential demand of a further 20,000 million kWh for space heating. In Winnipeg the average domestic consumption rose from 1,200 kWh in 1921 to over 4,500 kWh in 1934. Messrs. Forrest, Hobson & Tait showed at the National Convention that while the total power requirements were increasing by about 400,000 h.p. per annum there was an increase of only 250,000 h.p. in the amount of purchased electricity. There was need, then, for a considerable acceleration if the supply industry was to maintain its position in relation to the country's total power requirements.

The demand for railway electrification would, he anticipated, materialise within the next twenty years, while new applications would constantly arise.

Mr. Kennedy suggested therefore that Sir John's estimate of 47,000 million kWh per annum should be taken as a goal to be reached in ten or fifteen years "in the confident anticipation that the potential domestic and industrial demand, as we will then know it, will be far in excess of our present ideals."

In view of the fact that the Ministry of Transport Committee on Distribution was at present considering what steps to take to improve the organisation, Mr. Kennedy said that it would be inopportune for him to express any views. He urged, however, that whatever form of reorganisation was ultimately decided upon the industry should agree to sink individual differences and do its best to make the scheme a success, in the knowledge that by so doing it would be working in the national interest.

A Power Company and Contractors

MEMBERS of the staff of the Lancashire Electric Power Co. held a conference recently with more than forty electrical contractors at the Chorley showrooms. Mr. C. D. Taite, who presided and was supported by Mr. J. Purrett and members of the executive, made a brief survey of electrical achievements in Lancashire, and indicated that great scope existed for future developments.

Throughout the country, he said, more than 600,000 consumers had been obtained in the past year, and E.D.A. had launched a campaign for securing a million more during the next twelve months. As the cream had already been obtained, business would be in a sense harder to get, yet the rate of progress in the L.E.P. area was accelerating every year. It was estimated that taking Lancashire as a whole 49 per cent. of the houses were already connected. The speaker suggested that electrical contractors working in conjunction with the L.E.P. staff should do everything possible to secure the remaining 51 per cent. of the business quickly. The company had always endeavoured to co-operate with contractors and had definitely set itself against entering the wiring business. It had, instead, devised an assisted wiring scheme which studied contractors' interests. Mr. Taite invited contractors present to express their views on how the closest co-operation in all directions might be ensured.

A number of the contractors present gave frank expression to their views, certain speakers asking for more favourable terms under the assisted wiring scheme; others recognised that the L.E.P. terms compared very favourably with those of surrounding authorities. Considerable discussion followed on the company's two-part domestic tariff, and although certain speakers felt that the alteration of conditions might induce some new consumers to introduce more power plugs, other contractors felt that in its present form the tariff was most effective for obtaining the poorer class consumer, who provided the greater part of the new business so far as wiring was concerned.

Contractors expressed their satisfaction with the conference by asking for it to be repeated yearly, and Mr. Taite said that the company fully concurred and arrangements would be made accordingly. Mr. J. E. Eaves, of Messrs. Edward Dewhurst & Sons, of Preston, proposed, and Mr. J. Walsh, of Blackburn, seconded thanks to Mr. Taite for presiding.

Meetings and Discussions

The British Accumulator Industry

The Future of the Accumulator: Electricity in the Dairy: High-capacity Fuses

THE evolution of the modern storage battery during the past forty-five years was taken by Mr. E. C. McKinnon as the theme of his address as chairman of the North-Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS on October 22nd. Mr. McKinnon has himself been closely associated with this evolution.

Starting from the experiments of Planté in 1859, he traced the development of the applications of the battery from its use as an auxiliary to generating plant to such modern uses as those required in submarines, communication, transport (power, lighting and ignition), cinema sound transmission, miners' lamps, and aircraft.

The design of batteries has not materially altered for several years, but outstanding improvements are the sealed-in cell, which can be transported fully charged, and the mass-type cell, which can be put into service without initial charge merely by filling it with acid, both developments adding considerably to the convenience of the battery.

A modern development is trickle charging for stand-by batteries, which was first introduced in 1927 (at Bankside power station); by this method the open-circuit loss is balanced by an equivalent continuous charge and the condition of the cells is maintained indefinitely.

During the past thirty-five years the average life of the submarine battery has been increased by nearly 300 per cent. The watt-hour capacity has been trebled, and a single cell may have an output of 15,000 Ah and weigh 1½ tons. In contrast, a military aeroplane battery rated at 430 Wh for 10 hr. at 11¼ V weighs only 46 lb. It would give over 1,100 W for five minutes and would yield over 9¼ Wh per lb. at the 10-hour rate.

The correct types of electric battery for road traction (with a life of up to six times that of earlier batteries) have been available for some time, and rapid headway is now being made in the design of the vehicle and its electro-motive equipment. The electric kitchens on at least one of the leading British railways are supplied from storage batteries.

Although the battery has been ousted from its old position in generating stations, it still appears as an important component of sub-station plant, primarily for the remote control of switchgear, and there are at least seven varieties of heavy duties that it is now serving, *viz.*, emergency supply to auxiliaries; alternative to additional boilers and generating plant to meet winter peak; stand-by to hydro-electric supply in severe weather; reducing maximum demand of bulk supply; maintaining continuity of supply to process plant, where interruption would cause serious loss; avoidance of panic in large buildings; and insurance against pilfering in large stores in the event of failure of supply.

The alkaline-cell section of the accumulator industry has made considerable strides in recent years—formerly the application of this type was confined almost entirely to traction—and at least four firms in this country manufacture alkaline batteries.

At no time within the last thirty years of the seventy-five years of its existence has the outlook of the British battery industry appeared brighter than at present.

* * *

Electricity in Milk Production

THE desirability of utilising electricity in milk production was strongly emphasised in a lecture given by Mr. F. E. Rowland, at the Farmers' Electrical Conference held at the Dairy Show on October 24th.

Hygiene, he said, was almost as vital in milk production as it was in surgery. Electricity was synonymous with cleanliness and it was significant to observe at the Show the greater degree to which it was being used. If farmers as a whole only realised the advantages of electricity, its adoption would be much more rapid. Electrical methods represented finality, and farmers who were using other means would eventually become converted to electricity.

The installation of electric lighting in milking sheds and dairies was rapidly becoming universal, as there was no other method which possessed anything like its efficiency, convenience, safety and cleanliness. Electric motors provided a means of power which was instantly available under any conditions of weather or temperature. They were silent in operation, did not produce fumes or use fuel which might soil or contaminate, and occupied very little space in any out-of-the-way position. Electric motors driving milking machines could be situated in the milking shed, as they would not disturb the cows, and when driving milk coolers, pasteurisers, pumps or bottle-washers, they could be placed adjacent to milk, as there was no fear of contamination.

Electricity had made particular progress recently for sterilising milking utensils. Self-contained electric sterilising chests with heating elements incorporated occupied no more space than the chest, and entirely eliminated the necessity for a separate boiler room, together with the dust, dirt and labour associated with stoking fuel. These chests were frequently installed in situations where it would be impossible to use any other type of equipment. Small electric boilers might be used when steam was required for other purposes, and owing to their small size and absence of fuel, they required very little space and could be placed near the equipment with which they were to work.

Water could be heated electrically with similar facility. An adequate supply of water could be provided electrically for drinking and washing, and it was easy to make this service entirely automatic. Such an installation was not only a useful adjunct to cleanliness, but also might be a means of increasing the milk yield by ensuring that the cows had a liberal supply of drinking water.

It was only with experience that the benefits of electricity could be appreciated, and many farmers had found that its use saved more than its cost. In a paper read before the Farmers' Electrical Conference at the Royal Show, Derby, in 1933, Mr. S. E. Britton referred to some three hundred farms in the Chester area which were using electricity. Written statements supplied by sixteen farmers who were using electricity for a large number of different purposes furnished adequate proof of the value of electricity in the agricultural and dairy industries.

* * *

Fuses for Distribution Networks

AT the meeting of the London Technical Group of the Electrical Power Engineers' Association last week, Messrs. A. M. Pooley and H. Simmonds (of the English Electric Co.) read a paper on high rupturing capacity fuses for distribution networks and industrial systems.

They showed that two types are available: (1) that wired with a low-resistance high-melting point element, *e.g.*, silver, and (2) that wired with copper having a centre section of high-resistance low-melting point element, *e.g.*, tin or tin alloy. In the first type the resistance of a straight-through wire would be high enough to cause excessive temperature at full load and a voltage surge when interrupting a d.c. short-circuit. In the type described these effects are obviated by the use of a fabricated silver element the rating of which is determined by the diameter and length of a single wire at the centre, the strengthened ends reducing the resistance, and hence the temperature.

The reaction between the volatilised metal and the quartz filling is thermo-chemical and is confined to the area corresponding to the reduced section, the resultant material forming a solid non-conducting core having a breakdown value of over 5 kV per in. length. Fuses for 600 A with a rupturing capacity of over 40,000 kVA are available up to 660 V.

Oscillograms showed a pre-arcing time of 0.01 sec. and an arcing time of 0.019 sec., limiting the current to 20,000 A compared with 32,000 A for an air circuit-breaker with a pre-arcing time of 0.029 sec. and an arcing time of 0.012 sec. The peak value of the voltage surge for the latter was three times normal, and for the fuse 30 per cent. of normal line volts. The average rate of decrease of current during the arcing period was 2,670 A and 1,050 A per milli-sec. respectively.

The requirements of such a fuse are summed up as: (1) guaranteed minimum rupturing capacity throughout the range; (2) ability to carry full-load current without deterioration; (3) low potential drop; (4) quick rupture, accompanied by low voltage rise; (5) ability to withstand damp or chemical fumes; (6) silent operation without smoke or flame; (7) compliance with B.S.S. 88/1931.

In opening the discussion, Mr. W. K. Lewis submitted that there was a need for a conversion fuse for fitting to apparatus of any manufacturer. Mr. A. S. Silson disagreed

with the view that the renewable wire fuse was doomed, and Mr. A. G. Hilling referred to the difficulty of knowing whether a cartridge fuse had blown without taking it out.

Mr. W. J. Jeffery stated that he had replaced circuit-breakers (which needed continuous maintenance) by fuses of the type described in sub-stations and on consumers' premises with every satisfaction. He considered that they were required as much in small as in large circuits. Mr. W. J. Oswald preferred the circuit-breaker, which took less time to replace and could be switched in repeatedly if necessary.

In reply to Mr. J. R. Jones and Mr. G. Moor, Mr. Pooley said that the Home Office raised no objection to tightening the fuse in position by a screwdriver if it was insulated, as in the type of fuse described the live parts were sufficiently shrouded.

Mr. G. Hicks favoured the use of such fuses in new small houses. Mr. J. Parr-Morley suggested that the fitting of a boss to the fuse, into which a portable handle could be screwed, would enable it to be withdrawn more easily from an underground box. Mr. W. F. Andrews expressed the view that the non-deteriorating qualities of the authors' fuses gave them a great advantage over the renewable wire fuse (especially on a.c. circuits), as the latter tended eventually to blow at normal load.

* * *

Electricity on Irish Railways

TWENTY-FIVE years of electrical development on the Irish Free State railways, now known as the Great Southern Railway system, was the subject of Mr. W. Storey's address as chairman of the Irish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS in Dublin yesterday (Thursday). He said that the gradual electrification of the Inchicore workshops continued until 1916 when the power house capacity reached 1,300 kW d.c., the boilers being specially adapted to burn saw-mill waste. When energy began to be purchased in bulk from the Dublin Corporation about two-thirds of the works load was a.c. When the railways were amalgamated in 1925 several smaller works were closed and the plant was transferred to Inchicore, while the d.c. load was reduced to about 100 kW.

Last year the decision to build new locomotive erecting shops at Inchicore caused the Electricity Supply Board to increase the capacity of its sub-station by 50 per cent. Thus in twenty-five years the capacity had grown from 20 to 2,000 kW.

Line shafting had been, and was still being, replaced by individual driving motors. There were thirty-one gantry cranes, transporters and traversers in the works, varying in capacity from 50 to 2 tons, the most recently installed having variable-speed a.c. motors. A number of the planing machines had quick-return tables capable of accommodating loads up to 20 tons, one of them being driven by a 50 h.p. d.c. reversible motor with two 10-h.p. motors for other motions. To obviate "back lash" or "dead centre" on the table a motor-generator was employed in conjunction with the main motor, operated by contactors under push-button control.

At least six welding plants were in daily use, both a.c. and d.c., each system having its particular characteristics and uses. They were mounted on wheels for transportability, while spot welders were employed for less important work and an oxy-coal gas steel-cutting machine was controlled magnetically.

Three air compressors were driven by 100, 120 and 150 h.p. motors, portable air drills being employed because of their lighter weight, although the cost of power for the class of work dealt with was considerably higher than the power cost of portable electric machines.

More than fifty lathes were in use, some requiring 75 h.p. each, and for electro-plating motor-generators of up to 5,000 A at 8 V were in use. One-third of the works was lighted by high-pressure gas which it had been found difficult to dislodge on a cost basis. The remainder was electrically illuminated. Some high-pressure mercury-discharge lamps had been installed and the extension of this system was under consideration.

The seventy-five telephones throughout the works were incorporated with a fire alarm system.

Care was exercised in checking and controlling the use of electricity. Meters read at fixed periods enabled consumption to be charted, priced, and properly allocated.

Passenger buses and motor lorries were built and electrically equipped in the workshops. The relative merits and disadvantages of single- and double-battery systems of railway train lighting were discussed, and the address concluded with some details of the Drumm batteries which had been used experimentally for suburban railway traction. Two motor coaches had been working on the Amiens Street-Bray section of the railway system for over two years, and had completed over 100,000 train-miles, their constructional and control details being outlined.

* * *

The Nature of Service

THE inaugural address of Mr. J. B. Mavor as chairman of the Scottish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS was presented (in the author's absence owing to sickness) at Glasgow on October 29th. It dealt with the importance and responsibilities of the electrical industry in the structure of industrial Britain, pointing out that goodwill was generally accepted as a definite asset and frequently used as a negotiating point. Real goodwill only existed in a concern while its personnel was co-operating to do good. Its full value was not created until the customer, the company and its employés, and suppliers were all benefiting from its activities—and when that condition was attained money could not buy this asset.

Goodwill was created by mutual service and success was its complement. By the degree of service rendered to humanity the fruits of effort were classified and valued. Success really meant service successfully carried out, and not the collection of money. Few great scientists had died wealthy men: were they failures?

The tradition of this country, in spite of all the brutalities, anomalies, and inequalities that had come with industry, had been "work well done and service rendered." That tradition was not always lived up to, but the stability of the country now being so splendidly demonstrated was due in the greatest degree to this attitude.

All business was based on service; no item of commerce could be separated from it. But people often failed to keep this fact in the forefront in their daily lives; in a measure, service was beginning to mean *ex-gratia* fussing around after a transaction was otherwise complete. If the product were perfect and entirely serviceable, this part of service would be unnecessary.

Success in a business was the capacity so to order its services that it could procure a quota of work commensurate with its productive capacity. Where it became necessary to raise the productive capacity, the return already gained by exceeding the economic minimum was most wisely applied in doing this; thus the reward of services rendered was applied to increasing the service ability of the concern to its trading community.

Yet another and more important balance remained to be struck, for no firm or industry would eventually succeed if its prosperity were gained at the expense of its employés. Neither the buyer nor the seller might rejoice alone for very long nowadays. It was not only possible, but essential, that the spirit of mutual understanding and co-operation should be fostered in a way that would permeate downward through all ranks in industry. Engineers all knew how to face facts, because they must. The understanding of one's fellow men could not be taught, but must be learned, just as by rubbing shoulders one learned by trial and error how to conduct oneself in an acceptable manner.

* * *

Luminous-discharge Lamps

In addressing an informal meeting of the JUNIOR INSTITUTION OF ELECTRICAL ENGINEERS in London on October 25th on the latest improvements in luminous-discharge tubes for street lighting and workshop illumination, Mr. C. C. Paterson compared the efficiencies of various forms of electric lamps in terms of lumens per watt of power consumed, commencing with the carbon-filament incandescent lamp which gave 3½ lumens, the tungsten-filament gasfilled which gave 15 and was equal in this respect to neon sign tubes, and, finally, the 70 lumens per watt now obtainable from hot-cathode discharge lamps. He explained that by heating the cathode a much larger current could be passed through a short tube lamp without the sputtering effect caused by the gradual disintegration of the metal cathode and consequent absorption of the gas in the tube. The voltage at which the hot-cathode tube could be operated was in proportion less as the current consumption was greater, with consequent great decrease in the length of the tube and much greater brilliance per unit length. This in the cold-cathode tube was 5 candles per ft., whereas in the hot-cathode tube it was 110. The latest type of hot-cathode tube for street lighting was vertical, the discharge forming an extremely brilliant narrow cord of light about 6 in. high. The light from the lamp was deficient in red, but if combined with a neon tube the colour value could be corrected. The sodium lamp was highly efficient, 70 lumens per watt having been obtained, but the light from it being almost entirely yellow it was not as yet generally useful for ordinary street lighting. Future developments would be in the direction of improving the colour and still further increasing the efficiency of these tubes.

The Improvement of Street Lighting

Departmental Committee's interim report

THE Departmental Committee on Street Lighting, appointed by the Minister of Transport in June last, has issued an interim report conveying a number of recommendations. The chairman of the Committee is Major F. C. Cook (Ministry of Transport), and the members include Mr. J. F. Colquhoun, public lighting engineer, Sheffield, Mr. C. C. Paterson, O.B.E., and Dr. J. W. T. Walsh, M.A. (N.P.L.).

The Committee says that it has held nineteen meetings and has received evidence or memoranda from nineteen interested bodies including the Illuminating Engineering Society, the E.D.A., the Incorporated Association of Electric Power Companies, the I.M.E.A., the B.E.A.M.A. and E.L.M.A., apart from gas interests and road authorities' motorists', pedestrians' and police representatives.

It is pointed out that there is no obligation on local authorities in England and Wales to provide street lighting, save in exceptional circumstances, although in Scotland there is legislation on the subject. In the course of evidence it was shown that in one county in England on a stretch of 31.8 miles of road there were no fewer than nineteen different lighting systems. If the burden of lighting their part of the road were placed on some of the smaller authorities it would involve a rate of 10s. in the £, while if the County Council took over the lighting it could be carried out adequately for a county rate of approximately 0.65d. On an arterial road in the environs of London there are twenty-seven varying standards of lighting in 13 miles.

The Committee expresses the opinion that sudden changes in the intensity of lighting are fatiguing to drivers and inimical to road safety, and the evidence showed the need for a widening of administration in this matter. It has been proposed that grants from national funds should be made for the purpose of maintaining a certain consistent standard of lighting. It is estimated that the cost of providing and maintaining this would be between £300 and £400 per mile—75 per cent. of the average cost to County Councils of maintaining Class 1 roads throughout the country. If all classified roads in county boroughs and 20 per cent. of the classified roads in counties were lighted to the appropriate standard the annual cost would be about £3¼ million. The present expenditure on the lighting of such roads must be a very material proportion of this sum.

Pending any alteration of the existing administrative system, the Committee recommends that authorities contemplating the installation of lighting should consult neighbouring bodies in order to secure some sort of uniformity of system. It is agreed that patchy lighting of roads may be worse than no lighting at all.

The Standard Specification

The main features of the British Standard Specification for street lighting are reviewed, and it is considered that the codes of other countries are not superior to this specification. It is said, however, that not every installation designed within its provisions for a certain class is equally satisfactory. This matter is being given attention by those concerned, but the Committee considers that it would be undesirable to accept the specification in all its details as the means for defining the special requirements of traffic routes.

Discussing the view that objects on the carriageway are, in the majority of cases, seen by motor drivers in silhouette, provided the car headlights are not used, the Committee says that if this is correct a street lighting installation should produce a sufficiently bright background against which objects can be readily observed. The Committee has found that there is some conflict of technical opinion on the one hand as to whether, to the driver of a fast-moving vehicle, uniformity or non-uniformity of road surface brightness is the more conducive to visibility when coupled with the effects of glare, and on the other whether any quantitative expression can be given to the brightness factor, bearing in mind its dependence upon the condition of the road surface, the weather, the colour of objects, etc.

To study these important factors the Committee arranged for the erection of an experimental lighting installation, in the first instance on a straight, flat road about half a mile long, and in this connection it acknowledges the help which it has received from representatives of the electrical industry. Further practical investigation is proposed in regard to the special conditions obtaining at bends, road intersections, junctions and gradients.

For traffic routes (roads forming the main approaches to or traversing important centres of population, passing through detached built-up areas, or those on which there is an appreciable pedestrian traffic) it was held by most witnesses that the minimum standard of lighting should enable drivers to proceed with safety at 30 m.p.h. without the use of headlights. In the absence of any more satisfactory criterion the witnesses considered an effective installation to be one which they associated with a generously planned B.S.S. Class F, and pending further investigation the Committee recommends that the lighting units on such routes should be of at least the number and power of those required for this standard.

With regard to the designing of installations, the Committee suggests that in built-up or partly built-up areas it may be necessary to direct some of the light on to fences or the lower parts of buildings, and in certain cases to provide additional light flux for this purpose. Every effort should be made to ensure that the available light is employed so as to produce the maximum contrast between the brightness of the object to be viewed and the background against which it is seen. Care should also be taken to ensure that kerbs and footways are adequately lighted.

The Committee recommends for general adoption a mounting height of 25ft. with a 6ft. overhang, except in special circumstances, such as where the road is bordered by trees, when it may have to be reduced for lighting the kerb, or central suspension adopted. It is considered that there is an advantage in close spacing, especially on winding roads, and for normal purposes, even on straight roads, the spacing should not generally exceed 150ft. On bends the lamps should generally be on the outside of the curve. The positioning of lamps should be such as to provide the best visibility, rather than uniform spacing. In certain cases, owing to unsuitable positioning of the light sources, the middle part of a bend appears quite dark, and the Committee suggests the provision of an artificial light-coloured background as a possible remedy.

Overcoming Glare

On the question of glare, the Committee finds that, as yet, no simple evaluation has been established. Generally speaking, the adoption of a mounting height of 25ft. should largely overcome the difficulty, except near the crests of hills. In many instances glare is at present attributable to the use of directional fittings which concentrate the light to an excessive degree in a particular direction, and to their use under unsuitable conditions, *e.g.*, on relatively low posts widely spaced.

Difficulty has been found in formulating a recommendation dealing with the matter in quantitative terms, but the problem is considered so pressing that, pending the submission of revised and more adequate recommendations in a subsequent report, the Committee has made certain suggestions, pointing out that these need care in their application to any particular case. A modified definition of the so-called magnification ratio of directive fittings is given as " the ratio of the peak candle-power to the average of the values in all directions downward from the source and lying between 30 deg. and 45 deg. from the vertical." So defined, the ratio is not raised unduly by shadows cast immediately below the source. It is considered that fittings for which this ratio does not exceed six may often be used with advantage, but those having a higher ratio should be abandoned. When the mounting height is less than 18ft. and the spacing more than 150ft., the ratio of any fitting should not be in excess of three. In this connection the spacing-height ratios of the B.S.S. should not be exceeded. Every installation should be treated on its merits, subject to the limitations of the ratio, and attention should be paid to the essential problem of improving visibility rather than to the practicability of adopting fittings having the maximum permissible ratio.

With regard to the arrangement of light sources, single-side lighting should be avoided except at bends. While the reports deal only with " traffic routes," it is emphasised that there should be an easy gradation from the standard adopted on such routes to that obtaining in side streets. This may be done by increasing the power and, if necessary, the height of the first two or more lamps in the side street to intermediate values.

To obtain the most effective result with certain types of installation a semi-polished road surface is required (not so much as to be slippery), its lightness of colour being of secondary importance, while in other cases a light matt surface is to be preferred. The Committee recommends that in the selection of road surfacing materials consideration should be given as far as practicable to these questions.

Task for Specialised Engineers

Great importance is attached to the adequate maintenance of installations, and the Committee considers that economy and efficiency would result from lighting authorities appointing officers specialised in this class of work. Where circumstances do not warrant the appointment of a whole-time lighting engineer the situation may be met if the engineer to the local

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The E.A.W. House at Bristol

May I thank you once again for the very generous space which you have given to the work of the E.A.W., and in particular to the house which has just been erected at Bristol.

I should like, however, to correct what appears to be a wrong assumption in your editorial on this matter. The Bristol house was definitely intended to be a demonstration house for middle-class people to show that, with proper design and careful planning, an all-electric house could be built and equipped for a specific sum which would come within the range of the incomes of such people.

You will remember that last year our members carried on a very active campaign on electricity for the working woman, which commenced with an exhibition at our headquarters last November and which was subsequently strenuously conducted by our branches throughout the country, during which time we also prepared a report on "Electricity in Working Class Homes"; all these activities, we believe, contributed very materially towards promoting the idea of the need "for hiring and wiring schemes for working-class homes."

Having so definitely made a contribution towards the idea of electricity for the working woman, we feel that an association such as ours, which includes women of all grades of society, should, from time to time, conduct campaigns which will meet their varying needs and demonstrate to them the different ways in which electricity affects their household problems.

Referring to your last paragraph, as a matter of fact, the exhibition and campaign which we conducted for the working woman cost the Association very much more than the house at Bristol will, as the responsibility for building the house was entirely borne by the builder, the Association being only responsible for the architect's fees.

CAROLINE HASLETT,
Director, Electrical Association for Women.

London, S.W.1, *October 28th*.

The Nearly-all-electric House

In my letter on this subject in your issue of October 4th, I laid stress on the only novel point, the possibility of substituting an electric for a coal fire in the living room without increase in cost. It depends, of course, on some periods of switching off when not required. This in turn, if it is not to cause inconvenience, requires a type of fire which will give an immediate widespread radiant heat. It also requires interchangeable elements of different wattages.

All the makers are concentrating on the pretty fire, useful indeed as an auxiliary but not as a substitute for coal. I suggest that your readers should try it out and report results. If my idea is proved practicable, the way is open for a really substantial attack on the smoke problem *now*.

With reference to Mr. Marshman's query, "What about the masses?" I don't know the answer. I wish I did. My suggestion is applicable to fires used for heating rooms only. When I wrote I had no acquaintance with the combination stoves to which he refers. But immediately after I had to visit some friends in Manchester, and saw them. I also saw the results inside the house and outside. The conditions were vile even to a Londoner. The house I stayed in was a good-sized council house, semi-detached, good gardens well spaced for air, on a wide arterial road, six miles from central Manchester. I am told I have not seen the worst. The living room fire stove had a flue back boiler and went through the wall to an oven in the adjoining kitchen, and there was soot all over the place.

Going into the kitchen to escape the soot I found it noticeable in the air escaping from the oven on the other side. These conditions are normal but were milder than usual as the weather was moderate during my stay.

With one of these stoves a family can cook and heat the living room, take the edge off the temperature of the kitchen, heat, in some sort of fashion, water for about 2s. 6d. a week for coal used on a single fire. The house was wired for lighting, the charge being 4½d. per kWh with a minimum of £2 per annum. Gas cooker, boiler, and fires were installed free. The gas fires cost about 2d. an hour to run and they will be almost entirely unused.

The fire does everything and that means it must be alight all the year round. Large numbers of these houses exist and they are about ten years old. We hear that Manchester is getting a lot of electric cookers out. I don't think they will go in where there is an all-purpose fire.

But even those who abandon soot production will still find themselves afflicted by their neighbours' soot. It may be that this fact will cause them to deal with these combination fires which must be kept alight all the year round. Possibly it will be found that these stoves are too expensive later on: that the price has not all been paid when the 3s. has been handed to the coal man.

An ominous passage in Mr. Marshman's letter seems to bear this out. He evidently thinks "prolonged periods of sickness inevitable in every household." He writes rather naively as one who does not see the connection. Mr. Noel Carrington, writing in the *News Chronicle*, suggests that the Minister of Health should publish figures of sickness and death from polluted air and the permanent smoke blanket over the towns. The idea is good but it would not tell the whole tale of the misery of the women struggling with the filth that everything and everybody in the home is covered with.

Mr. Marshman will understand, of course, that the service given by the figure 8s. 1d. was not comparable with the 2s. 10d. which he gives. The water was heated by apparatus for that one job and at 3s. per week was often hot, whereas at 2s. 10d. for the all-round job the water would seldom be hot. In the house in which I stayed the water was sometimes hot by 11 a.m. It did not arrive when wanted but only when the other services permitted it.

It is sometimes thought that electric lighting leads to other electrical applications. But where these awful stoves exist electricity will not develop except for an iron perhaps.

Meanwhile, I who am not in the trade echo Mr. Marshman's cry, "What about it?" Is it essential for us all to go out covered in filth in 1935? Has the electrical trade nothing to suggest for the future? In this connection, while the E.D.A. scheme may be successful in selling 6,000 million more units from the grid by selling a couple of dozen units per week to a large number of poor people, it will do little for the smoke problem. I shall be delighted if I am proved wrong in this.

My letter did not make it clear that the figures I gave were from a house that I have since left. I have found the advantage of electricity so great that I have now said good-bye to the coal merchant. It would be interesting to get details from other readers of the cost of running moderately priced all-electric houses (say £800 as in my case). H. C. GOSTICK.

Ewell, *October 28th*.

Too Much Current!

The following episode admirably illustrates how an ignorant traveller can "get away with it" so far as the ordinary householder is concerned.

This traveller called at the home of a user of a vacuum cleaner manufactured by his company to investigate a complaint. As he was totally incapable of finding the fault he at last picked up the plug on the end of the flex and exclaimed: "Ah! here is the source of your trouble. This is a 15-ampere plug. It is much too big and is passing too much current to the machine."

No doubt your readers will feel inclined to doubt the truth of this story, but I can vouch for its authenticity.

Glasgow, *October 19th*. F. FERGUSON.

Improvement of Street Lighting (*Continued from preceding page*)

authority has made a special study of street lighting and is competent to deal with the technical aspects of the problem, or by the appointment to his staff of an officer who has specialised in street lighting practice and whose time could be allocated to the planning and maintenance of installations.

The influence of incidental private lighting, illuminated signs, and so forth, on the efficiency of street lighting is referred to, and the Committee finds the general feeling to be that such extraneous illumination renders effective street lighting more difficult unless some degree of control is exercised by the lighting authority; certain limited powers of this kind are already in existence, but generally they are mainly concerned with public safety from such points of view as weight of apparatus, positioning and confusion with traffic signs. The Committee considers that definite power to control extraneous lighting, in so far as it may be seriously detrimental to the street lighting, should be given to the lighting authorities. All street lighting installations should be complete in themselves, without reliance on such illumination as shop lighting.

It is recommended that a lighting authority should consult with the railway company concerned before work is started on a new or improved installation which might interfere with the sighting of railway signals.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

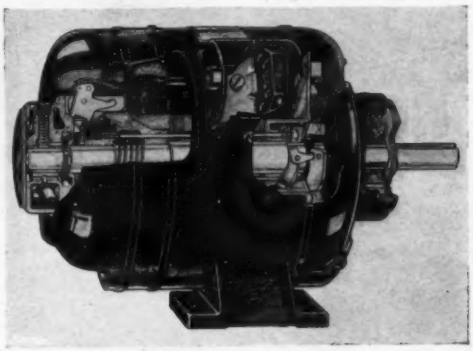
A Sleeve Bearing for Motors

A new sleeve bearing has been designed for Crompton "Minor" motors (1/20 to 1½ h.p.) which is claimed to make the lubrication foolproof and to result in more silent running than is obtainable with ball bearings. The housing of the bearing is on the lines of the unspillable inkwell and provides a reserve of oil, in addition to that contained in the wool wicks, enough to last up to two years. Lubrication of the thrust surfaces is obtained positively by a separate wick direct from the oil supply to the thrust collars; this is in addition to the oil that escapes from the ends of the bearing in the ordinary way.

End movement of the rotor is cushioned by spring washers at each end. The thrust washer in rubbing contact with the bearing is keyed to the shaft, thus preventing relative rotation between it and any packing shims. Duplex wicks of woven wool secure a free flow of oil and tendency to slackness after running in is guarded against by the diamond boring of the bearing bush.

In the repulsion-induction motors, four brushes are provided for all except two-pole machines with a view to securing, in conjunction with the positive brush-lifting and short-circuiting gear, the least possible wear of brush and commutator.

The brush rocker is spigoted on the motor end shield and by slackening two nuts it can be set for a different direction of rotation. The short-circuiting gear consists of a single phosphor-bronze disc backed by a compression spring mounted on a sliding bush that carries the brush-lifting ring. It is operated through tension rods by centrifugal governor gear. Messrs. CROMPTON PARKINSON, LTD., Bush House, Aldwych, London, W.C.2, are the originators of this development.



A Crompton "Minor" motor fitted with the new "Marathon" bearing (shown on the left)

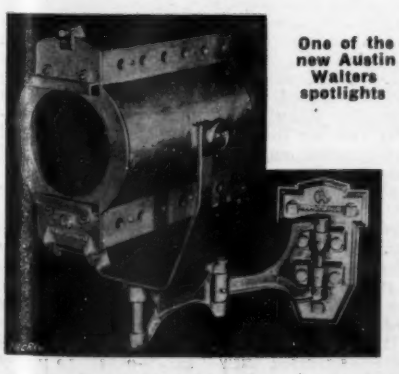
A Bakelite Lampholder

A lampholder of unusually simple construction has been sent to us by the COLLIER ELECTRIC CO., LTD., 2a, Alexandra Road, East Croydon. It is made of moulded brown bakelite in three parts, the body being moulded in one piece. The terminals are combined with the spring plungers and there is a bakelite shield between them which at the same time provides a cord-grip.

The Collier bakelite lampholder

A Range of Spotlights

A 200-250 W spotlight introduced recently by MESSRS. AUSTIN WALTERS & SON, LTD., Little Peter Street, Manchester, consists of a cast aluminium body with a hinged front by dropping which access is gained to the lamp. A 4½ in. by 6½ in. plano-convex lens is fitted with a non-inflammable colour medium in a metal frame. The malleable cast-iron wall bracket illustrated enables the spotlight to be placed against a wall.



One of the new Austin Walters spotlights

Spotlights of 500 and 1,000 W with 5 by 9-in. and 6 by 9-in. lenses have cast-aluminium ends and a bottom tray, the ventilated body being constructed of sheet steel and finished in crystalline enamel. The backs are hinged to give access to the interior.

Reflector Lamps

The makers of the "Boula" reflector lamp, which has been in use for three or four years, have now produced an axial "daylight" reflector lamp for general use, particularly where colours are used or displayed. The shape of the lamp, together with the reflecting surface and the daylight effect, is intended to appeal especially to silversmiths and jewellers who desire the true tint value of silver to be maintained. Separate reflectors or shades are not needed, for a silver-mirror reflector is permanently attached to the exterior surface of the lamp and is protected by a tough skin of copper, which is guaranteed not to peel off.

For special purposes, such as illuminating drawing-boards, jewellers' benches, &c., "Boula" lamps can be supplied, at no extra cost, with the reflecting surface deposited at the top, bottom, side, obliquely, or patch shape.

The makers are the BOULA REFLECTOR LAMP CO., 156, Charing Cross Road, London, W.C.2.

Improved "Rawlplug" Tool

Samples have been sent to us of a new type of tool made by the RAWLPLUG CO., LTD., Cromwell Road, London, S.W.7. A leading feature is that the drill will not jam in the holder, being easily ejected by tapping the latter, while the life is claimed to be double that of the old type. The "Speedtool" is a combination of a non-brittle steel with the highest Brinell figure yet used successfully in a percussion tool. In addition the tool is constructed to eliminate drift.

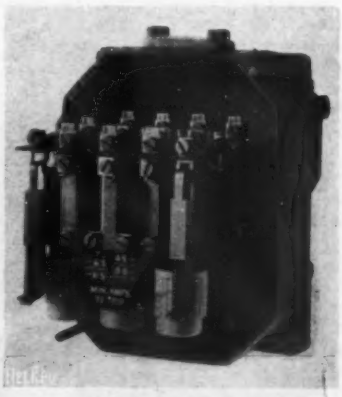
A vibratory action results when the holder is struck, while at the same time the full force of the hammer blow is transmitted along the longitudinal axis and concentrated upon the points of contact between the edges of the tool and the work.

The drill is provided with longitudinal grooves of special section so that when sharpening the most effective cutting form can be obtained by using an ordinary grindstone. The cuttings are automatically expelled by the vibratory action as the bit enters the work.

Starting Small Motors

Novel features of the "SCI" direct-switching a.c. motor starter made by Messrs. ALLEN WEST & CO., LTD., Brighton, include adjustable magnetic overload releases with oil dashpot time lags from 7½ h.p. down to the smallest size of fractional h.p. machine, a reversible case requiring two fixing screws only and allowing either top or bottom and two side cable entries, and an interior detachable as one unit.

The starter is of the totally enclosed, air-break type comprising a magnetically operated triple-pole contactor with a vertical double break per pole, a fourth pole being incorporated for maintaining the operating coil circuit. All contacts are faced with silver. The overload release is adjustable from 25 per cent. upwards; a no-voltage release is also provided. A cast-iron base and front cover with packed joint, are employed. The complete interior is mounted between two mild-steel clamps, removal being effected by slackening off the clamp fixing screws. Operation is by push-button or pilot switch.



Interior of the new Allen West starter

A Sterilising Chest

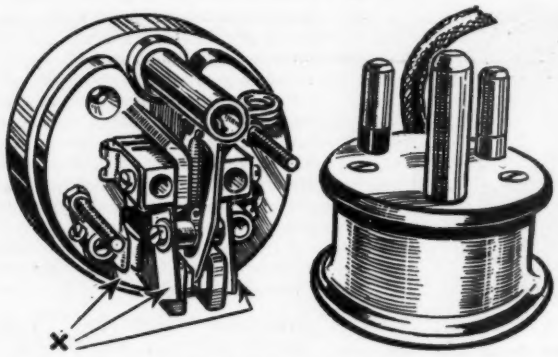
A new development by MESSRS. AVELING-BARFORD, LTD., Grantham, is an improved type of electric sterilising chest with an automatic feed that replenishes the water supply only

D

to the extent of the amount evaporated. The automatic feed device enables the amount of water used to be reduced to a minimum, and thereby reduces by two-thirds the time normally taken to raise steam, the amount of electricity used being proportionately less. Furthermore, due to the fitting of another type of immersion heater, the time taken to reach the required temperature in the chest has been reduced. The immersion heaters discharge their heat very rapidly, and immediately the current is switched off, the temperature of water, due to the small amount employed, falls at almost the same rate as the heating elements, and very little further evaporation occurs. This enables the utensils in the chest to dry off rapidly. Four sizes are made, ranging from 12 cu. ft. to 75 cu. ft. capacity.

An Automatic Switch-plug

A switchplug embodying several special features has been sent to us by MR. J. TOUBKIN, Faraday House, Todd Street, Manchester, 3, who has taken over the works of Electrical Appliances, Ltd., of Walton-le-Dale. Called the "Golden Arrow," it is of the safety type built up on a circular block



The "Golden Arrow" switchplug showing the contact blades (X) open

of brown porcelain and protected by a bakelite cover. The actual movement of inserting the plug operates the switch. As the earthed pin enters its socket it depresses a sprung arm which, in turn, operates the q.m. and b. mechanism of the switch.

The length of the earth pin is such that the live pins are well clear of the sockets before the switch springs to the "off" position upon the withdrawal of the plug.

The live and neutral pins are clearly distinguished by red and black markings.

Cable Jointing and Installation Equipment

The range of Henley cable jointing and installation equipment has recently been extended to include several new items, such as expansion bolts, comprising a four-part metal shell loosely assembled in a ferrule, and a special taper bolt; cable hangers; and steel trestles. The last-named are available in two forms, namely, the "Pakflat" and the collapsible tubular type. These can be used as road trestles for holding scaffold poles, for holding overhead line poles, and as a light cable drum stand. They weigh and cost less than the wooden type, and forty steel trestles can be packed in the space occupied by a wooden one. The tubular tripod allows scaffold poles to rest on it at right angles to each other, and lamps can be suspended from hooks inserted in the upper ends of the tubes. The manufacturers are MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1.

The Henley tubular trestles

A Directional Lamp

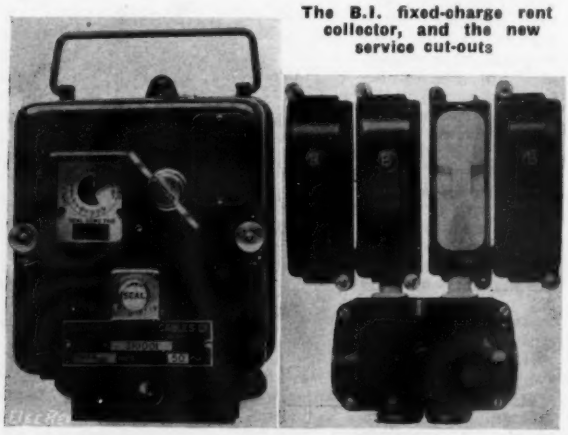
The new "Excelsior" lamp of the BRITANNIA ELECTRIC LAMP WORKS (1934), LTD., Chase Estate, Park Road, London, N.W.10, has been designed with a view to giving increased light in a vertical plane.

The lamp is mushroom shaped with the bottom half stippled and frosted, while the top part is of opal glass, in order to direct the light downwards, the filament being centrally situated between the opal portion and the stippled glass.

The "Excelsior" lamp

Recent B.I. Developments

AMONG a range of new products being introduced by BRITISH INSULATED CABLES, LTD., Prescot, Lancs., is a rent collector which allows the collection of a definite sum per week and, in the event of non-payment of instalments, cuts off the electricity supply until the arrears are made up. The instrument is installed as a separate unit to the ordinary meter, so that when the money due for hire-purchase of apparatus has been paid off it may be removed. An advantage claimed is that in the summer quarters a high price per kWh need not be charged to enable the amounts payable as rental to be recovered. The two accounts are kept separate. The instrument may also be used to collect the fixed charge under a two-part tariff.



The B.I. fixed-charge rent collector, and the new service cut-outs

The apparatus consists of prepayment mechanism as used in B.I. standard prepayment meters, and a constant-speed self-starting motor drive, the whole being enclosed in a stove-enamelled pressed-steel case. The insertion of a coin allows the motor to run for a predetermined number of hours, depending on the amount to be collected. If, for instance, the instrument is calibrated to collect a shilling per week, it will run for 168 hours, and if two shillings, 84 hours, after the insertion of each coin. Any number of coins up to seven may be inserted in advance and the number of coins unused is indicated in black on the dial. When the time provided for by the coin or coins has elapsed the supply is switched off. The motor, however, continues to run and the arrears are indicated in red on the dial. A separate dial shows the total number of coins inserted. The coin box is fitted with a special lock incorporating a sealing device. The rent collector weighs 6¼ lb., and its overall dimensions are: height, 8¼ in.; width, 5¾ in.; depth, 5¾ in.

Another product is a range of high-voltage condensers for use in radio and television circuits. These have a paper dielectric and are petroleum-jelly impregnated, being designed for working voltages of 1,000, 1,500 and 2,000 d.c. in capacities from 0.10 to 10.0 μF. They are made up in hermetically sealed metal cases and can be used under temperature conditions up to 140 deg. F.

For terminating small paper-insulated cables the company has just brought out a terminal box made from moulded insulating material. This is suitable for l.v. single, twin and multi-core cables up to 0.0225 sq. in. and for single-core cables up to 0.06 sq. in. section. The box, which is 4 7/16 in. long and 2¾ in. wide, is composed of two similar halves, held in place by means of two fixing screws. A wood bush is provided at the lower end for the entrance of the lead-covered cable, while, at the upper end, there is a spigoted cap of the same material as the box, with five circular "knock-out" recesses, any or all of which may be used for taking out the cores.

The centre "knock-out" is the largest and it will take up to 0.06 sq. in. A "knock-out" is also provided in the body of the box for filling purposes when the box is horizontal. There is also a range of service cut-outs in non-conductive cases, designed to provide two or more circuits from the same service cables, each circuit having its own fuse fed from bus-bars. The B.I. standard fuse and base are used and the bakelite cases are provided with "knock-outs" to permit of the passage of the bus-bars from cut-out to cut-out. Insulating bushes and shields are provided for the bus-bars. These cut-outs can be built up in a variety of arrangements.

Illuminated Fountains

An attractive form of civic decoration

AMONG the many attractive devices now available to those responsible for the beautification of holiday resorts and other towns there is probably none of greater value than the illuminated fountain, and it is safe to say that wherever one has been installed it has quickly paid for itself by prolonging the season and improving trade generally.

Recently what is believed to be the largest fountain yet constructed in this country was opened at Queen's Gardens, Hull. Here a main central basin 16 ft. wide by 9½ ft. high, octagonal in shape, is surmounted by a solid bronze lip which itself houses 112 green 40-W "Royal Ediswan" lamps and provides "pelmet" lighting for water cascading over the edge.

The basin consists of an upper platform which carries the whole of the floodlight projectors and the hydraulic sprays and jets. Below this platform is a chamber which houses the apparatus for controlling the electrical and hydraulic effects. The centre basin and chamber are situated in the centre of a lower circular basin 60 ft. in diameter, and this is surrounded by a low parapet wall. The floor of this basin is finished in coloured terrazzo patterns. The concrete work throughout is finished in a light salmon colour. Four small subsidiary fountains surround the main one and are erected on the floor of the lower basin. Each of these is 2 ft. 9 in. high and 2 ft. 9 in. in diameter and is equipped with a 1,000-W floodlight with amber glass cover. Also there is fitted a 10-mm. hydraulic fire nozzle and a 40-way jet ring (jet aperture ⅛ in.). These small fountains although normally operating with the main one may be used by themselves.

Water is maintained in the lower basins at a depth of 2 ft. and the level is controlled by a ball-float valve which is concealed in the outer parapet wall. It is drawn therefrom into the chamber under the main central basin through two specially constructed strainers by means of two pumps, one supplying the main top basin (15 h.p.) and the other the four subsidiary fountains (8½ h.p.) respectively. In the case of the main fountain the water is pumped into a 4-in. manifold from which outlets are taken to feed the five groups of equipment which constitute the fountain. Each group consists of a bronze ring with forty jets fitted, together with a 12-mm. bronze fire nozzle. In addition to this the centre group has a large spray to provide a whirling cloud effect. The water circulates continuously and only that lost by spray drift and evaporation has to be replaced—enough to keep it fresh.

The fountain and cascade at Southsea Winter Gardens is never without admirers

Each effect of the five groups of the main fountain is controlled by special hydro-electric valves which in turn are controlled by a flasher, the complete water effect change occupying eight minutes. This controller also causes the lighting to pass through a complete cycle of change every 60 seconds.

The electricity supply to the main fountain is brought by an underground main to the chamber in the centre of the lower basin. The thirty 1-kW submerged floodlight projectors are arranged in five groups of six projectors, each group having various combinations of colour screens, *i.e.*, white, red, blue and green, which form the main fountain.

The whole of the various electrical sections of the installations, together with pump motors, &c., is controlled by contactors operated by remote "on" and "off" push buttons situated in one of the ornamental blocks of the outer basin wall. The sequence of events is so arranged that exactly the same combination of water and colour repeats itself about every 37 mins. The maximum illumination at any one time is equivalent to more than 25,000 c.p., and the colour floodlighting amply covers the highest throw of the main jet—about 45 ft.

The Queen's Gardens are also illuminated by special invisible reflectors that display to advantage the floral beds, and the Wilberforce Monument is to be floodlighted. The total illumination in the whole of the gardens is equivalent to more than 50,000 c.p.

The fountain has been designed by the Edison Swan Electric Co., Ltd., the structural and hydraulic work being carried out by the City Engineer's Department. The whole of the electrical work was carried out by the Electricity Department of which Mr. J. N. Waite is the general manager and engineer.

The illuminated fountain recently installed at Queen's Gardens, Hull, is the largest yet constructed in this country

A similar fountain, although smaller, with additional interesting features, has also recently been completed for the Portsmouth City Council at the Southsea Winter Gardens. This also was designed by the Edison Swan Co., Messrs. Dicks, Ltd., of Winchester, carrying out the electrical and hydraulic work.

For this installation only seven 1-kW floodlight projectors (two blue, two green, and one each of white, red and amber) have been employed in the 10ft. diameter octagonal central basin. The centre hydraulic unit comprises a 65-way jet ring and a 12-mm. fire nozzle and three 7.5-mm. sprays are utilised.

The general arrangement, timing, &c., are similar to those at Hull, but the pumping plant is installed in a pump house built below the ground not far from the fountain.

The water overflowing from the central basin falls eight feet into the 40-ft. diameter lower basin, from which it is discharged over a very imposing illuminated cascade. This cascade incorporates four boxes fitted with diffusing glass fronts, each box containing 40-W lamps of various colours. Its illumination, which is remote push-button controlled, is also flasher operated and has a 24-40 second cycle. The water in the pool at the bottom of the cascade is pumped back through the fountain, a ball-float valve attached to the city's mains providing for the replenishment of any lost through evaporation or blown spray.

We were given an opportunity of witnessing a demonstration of the Hull fountain (which was not then in regular commission) on the occasion of our recent visit, particulars of which appear on page 593. It provided a most attractive spectacle and might be compared to a good firework display by electrical methods.

The Egyptian Electrical Market

IN his report to the Department of Overseas Trade on the economic conditions in Egypt (Stationery Office, 3s. net), Mr. G. H. Selous, Commercial Secretary at Cairo, states that as a result of the further extensions of the North Delta electricity scheme the transmission lines now account for approximately £E.810,000, which is an increase of about £E.190,000 on the figures quoted in the previous report (dated July, 1933). In a recent adjudication for the Balamoun, Fua and Sera electric pumping stations, seven firms submitted tenders, including one from the United Kingdom, whose price was, however, the highest. The contract for Balamoun (£E.50,000) was placed with a Swiss firm, whilst the contracts for Fua (£E.52,000) and Seru (£E.33,000) were awarded to German firms. New apparatus for the Telegraphs and Telephones Administration amounted to £E.54,000 in 1933 and £E.77,000 in 1934, and was almost exclusively obtained from the United Kingdom.

Dealing with imports into Egypt, Mr. Selous states that an increase in the number of stationary internal-combustion engines imported (300 in 1933 and 432 in 1934) was accompanied by a fall in the total value from £E.147,115 to £E.130,137. Imports from the United Kingdom showed an improvement at 313 engines, valued at £E.70,000, in 1934, compared with 221 and £E.60,000 respectively in the preceding year. Imports of steam boilers and generators during 1934 were valued at £E.14,752, as compared with £E.12,157 in 1933. United Kingdom imports showed an increase from £E.6,158 in 1933 to £E.10,269 last year.

A further considerable fall was registered in the imports into Egypt during 1933 and 1934 of electric generators, transformers and motors, the figures being £E.80,881 for 1934 and £E.80,278 in 1933, as compared with £E.164,742 and £E.192,627 in 1932 and 1931 respectively.

The imports from the United Kingdom of radio sets and components do not compare favourably with those of Continental countries, this country's share of the 24,847 receiving sets imported, valued at £E.155,923, being 1,159 sets (£E.9,674), as compared with 13,462 (£E.80,044) from the United States and 6,754 sets (£E.42,310) from the Netherlands. Mr. Selous says that it is to be regretted that when the Egyptian market offered United Kingdom manufacturers an outlet for their products they were slow to seize the opportunity to produce radio sets suitable to local requirements, with the result that the market was in a short space of time secured by United States manufacturers.

Electric lamps are now being manufactured in Egypt, but a considerable quantity is imported from the Netherlands (£E.12,503), Hungary (£E.8,208), the United Kingdom (£E.6,764), and Japan (£E.6,238). The total imports in 1934, including the foregoing figures, amounted to £E.43,818, and as these figures show an increase over previous years it may be assumed that local competition is not yet being felt. So long as the cost of electricity remains high the demand for domestic apparatus will not be appreciable, with the exception of refrigerators (both for domestic and commercial use), which are becoming increasingly popular. In respect of smaller appliances, such as fans, irons, kettles, toasters, and hair-dryers, a small demand exists, particularly for fans, but in this case, too, it is limited on account of the high cost of electrical energy to the wealthier classes of the Egyptian population.

During the year 1933-34 a special section of the State Telegraphs and Telephones Administration was formed to administer a State broadcasting service. A main transmitting station of 20 kW for Cairo and a relay station for Alexandria are now in operation. Schemes for a further development of the service have been prepared.

The number of telephone lines in operation has advanced from 44,169 to 46,240, an increase of 2,071 as compared with 1933-34. During the same year automatic exchanges were introduced in Heliopolis and Port Said, bringing all subscribers in Cairo and Port Said on to automatic working. The Cairo suburbs of Giza and Maadi are now the only outstanding manual exchanges, but the former is being converted. The principal works on which expenditure was incurred in the year 1933-34 on the telephone system were new exchange buildings in Cairo suburbs; complete automatic exchanges in Alexandria and Heliopolis; cabling and replacement of obsolete cabling; additional subscribers' equipment; trunk lines; plant and tools.

New Books

Modern Radio Communication. (Volume 2.) By J. H. REYNER. Pp. 165; figs. 111. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d. net.

The fifth edition of "Modern Radio Communication" has been issued in two volumes, the first of which was reviewed in these columns a few months ago. The second volume has been written to cover the recent enlargement of the scope covered by the City and Guilds examination, the principles outlined in volume 1 being amplified and sufficient new matter added to cover the syllabus for the final examination of the City and Guilds.

As in the previous volume only elementary mathematics is used, and the text, which extends the information in volume 1 on the fundamental principles governing radio communication, is given in the form of an outline. The information is accurate, up to date, and, due to limitation of space, very concise. Some numerical examples, with answers, are given at the end of most of the chapters, and the paper set at the 1934 City and Guilds final examination is included. Besides its special suitability as a textbook for these examinations, the book, in conjunction with volume 1, provides a good general groundwork for the radio engineer.

Electrical Measurements in Principle and Practice. By H. COBDEN TURNER and E. H. W. BANNER. Pp. 354; figs. 219. London: Chapman & Hall, Ltd. Price 15s.

This book nominally covers the whole of the ground indicated by its title and is intended to meet the needs of the elementary student, or of the engineer requiring a handbook of reference, rather than those of the specialist. It is divided into five main parts, the first of which deals with electrical units and ultimate standards of measurement. In the second part typical electrical instruments are described, and the underlying theory is briefly sketched. The next two parts deal with the measurement of electrical quantities and the electrical constants of materials and apparatus, while the final section is devoted to a brief consideration of the measurement of non-electrical quantities by electrical methods. In spite of the nominally comprehensive character of the work its bias is distinctly on the laboratory side, as the references to the important matter of the commercial measurement of energy in a.c. circuits is so scanty as to be of doubtful use. On the other hand the chapters dealing with bridge methods of measuring inductance and capacitance and with magnetic measurements are very full and complete. An interesting feature is the detailed description of modern methods of measuring light intensity by photo-electric devices. The book is well illustrated and indexed, and it contains two appendices. The first is a chart indicating graphically the effective range of useful application of all types of commercial measuring devices; this is just the sort of thing required by the practical man. The other is a glossary of technical terms relating to electrical measurements. In spite of the praiseworthy plan of the work as conceived by the authors, there are signs that it suffers from a lack of careful final revision. In the glossary, for instance, the terms "dead beat" and "aperiodic" are referred to as synonymous, whereas, distinct meanings are assigned in the "B.S. Glossary of Electrical Terms." The definition of "instantaneous value" is mere tautology.

Unsolved Problems of Science. By A. W. HASLETT. Pp. 317. London: G. Bell & Sons. Price 7s. 6d.

This work in some respects is a review of scientific knowledge—or rather a small part of it—in so far as what is known is so much less than what remains to be discovered. It comes within the category of those books which, while intended to have a popular appeal, can nevertheless be read with profit by others possessing scientific knowledge who wish to obtain a general view of developments in other fields.

Electrical questions considered are mainly those more nearly allied with physics, and the heavy engineer need not expect to find much to help him to envisage the difficulties which he has to surmount. References to X-rays appear with notable frequency, and the author holds out a hope that two-million volt X-rays may take the place of radium for medical use. A large proportion of the matter of greatest electrical interest comes significantly enough in the chapter entitled "Nature beats the Scientist," but it is, at any rate, admitted that in radio transmission the electrical engineer's technique is superior to that of Nature.

Principles of Experimental and Theoretical Electrochemistry. By MALCOLM DOLE. Pp. 549; illus. London: McGraw-Hill Publishing Co., Ltd. Price 30s.

The author approaches the theory of electrochemistry for students with an interesting historical introduction discussing in an instructive manner the early steps and failures of well-known physicists of the past. The theoretical side is presented in a clear and readable manner, followed at the end of each chapter with appropriate exercises.

In introducing the practice of electrical measurements the author touches on a by no means easy subject. References could with advantage be made, *inter alia*, to Hague on a.c. bridge methods and to works on modern electrical and radio measurements, where many of the pitfalls encountered in such work are more fully discussed. The shape of the sine

curves on pages 45 and 47 are not the usual conceptions of sine curves. The chapter dealing with measurements of potential difference might with advantage be enlarged. The practice of using a quadrant electrometer for the precise measurement of small e.m.f.s involves inaccuracies. On page 219 mention could be made of Moullin's valve voltmeter and similar recent developments of the application of valves for small e.m.f. readings. Again, there is no reference to the use of vibration galvanometers as a source of detection, and a little more matter on oscillators for the generation of a.c. would have been an advantage.

A full discussion of this subject of measurements would considerably extend the size and price of the book; this matter might perhaps better be left to another volume. The book can be recommended and, with its attractive and concise form, is a welcome addition to the literature of electrochemistry.

Wireless Telegraphy—Notes for Students. By W. E. CROOK. Pp. 189; figs. 228. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d. net.

As the title implies, this book it not meant to be a complete treatise; the author states that it should not be used as a text-book, but as an accompaniment to text-books. Mr. Crook is the senior wireless instructor of Air Service Training, Ltd., and the ground covered in the book is that required for the air licence for wireless telegraph operators.

No previous knowledge of electricity is assumed, and elementary mathematics only is employed. No numerical examples are given as these are considered to be in the province of the text-book and the instructor; for the same reason batteries are not dealt with, though some dozen pages are devoted to power supply machinery and rectifiers. But the author anticipates criticism of what is or what is not included, and meets it generally from his experience as a teacher of the subject and from the fact that the book has been prepared with the requirements of an examination constantly in view, these requirements, the author says, not being met by any existing work. Earlier fundamental principles are dealt with more fully than the later practical developments, a plan which, it is thought, all teachers will endorse.

The book deals simply and clearly with the fundamental principles of wireless communication, and their application in practice. Great detail is avoided, but so, too, is sketchiness in trying to cover too wide a field, a mistake made in so many books on this subject. In fact, this book has a distinct advantage in being written with definite requirements in view. It confines itself to those requirements, and treats them in a way which might be expected from an experienced teacher.

The book should be of great value to students working for the air operators' licence, and might be used, too, with advantage by other students of the subject.

Machine Drawing.—Book I. By the late T. JONES and T. G. JONES. Pp. 138; illus. Manchester: J. Heywood, Ltd. Price 6s. net.

Most engineers during their college training have acquired some of their practice in machine drawing from books by these authors. The work under review (the full title of which is "Machine Drawing for the Use of Engineering Students in Science and Technical Schools and Colleges") is a revised edition, which now contains 69 line reproductions of drawings and sketches in the Jones's inimitable style. The early pages are devoted to the elements of drawing and projection. Then follow types of fastenings, joints and couplings, which are succeeded by about forty examples of engine and machine details, chiefly relating to steam engines (including locomotives), gas and petrol engines, pumps, and machine tools.

In the choice and preparation of these examples and exercises, the authors have aimed at developing the student's imagination and constructive ability. Thus, except in a few cases, the student is required to draw additional views to those given in the copy, or alternatively to draw views of an assembled machine from details of its parts.

With a book which has been established for a decade, the problem of adding new material to keep abreast of modern practice is difficult to author and publisher alike. In the present case there are only a few examples in which some of the older material could have been discarded. The most serious omissions occur in the "fastenings" section, in which no mention is made of welding and welded joints. Electric and other forms of welding are now so widely employed that the student should be shown how such joints are represented.

* * *

Shorter Notices

The first part of a new series entitled "Plumbing and Domestic Engineering" has recently been published by Messrs. George Newnes, Ltd., London. This work, to be completed in about thirty weekly parts at 1s. per part, covers a variety of subjects, including electric lighting and ventilation, and contains 1,200 illustrations as well as many useful charts and tables.

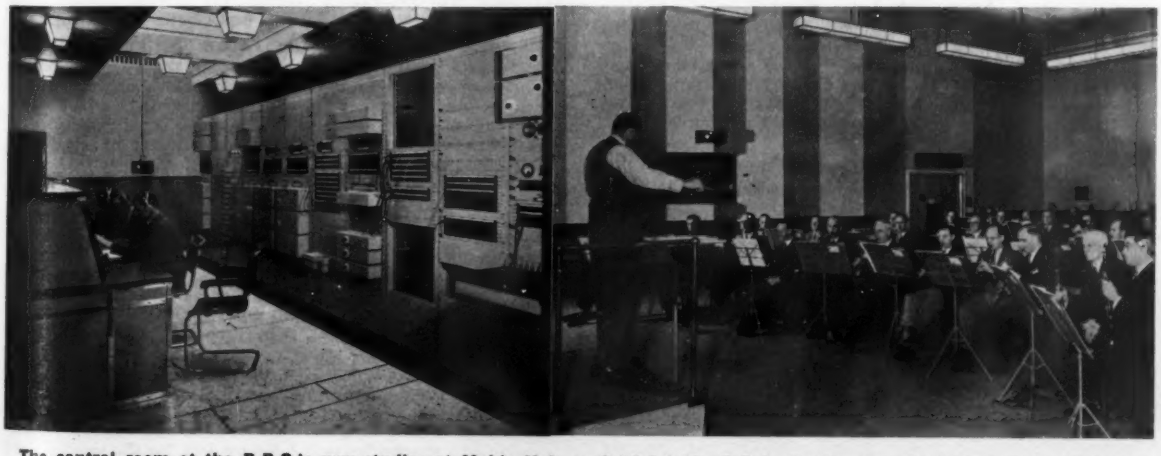
"Elements of Electrical Engineering," by A. L. Cook. (Third edition.) Pp. 603; figs. 393. London: Chapman & Hall, Ltd. Price 20s.

"Elementary Electrical Engineering," by A. E. Clayton and H. J. Shelley. (Second edition). Pp. 462; figs. London: Longmans, Green & Co., Ltd. Price 7s. 6d. net.

New B.B.C. Studios

THE British Broadcasting Corporation's large studio (No. 1) at the converted roller skating rink at Delaware Road, Maida Vale, has now been in regular use for about a year. Last week-end four smaller studios constructed in the remaining space there were brought into service. Studios Nos. 2 and 3, which are designed for orchestral performances, each have a floor area of about 3,000 sq. ft., but their acoustical design differs considerably. The wall surfaces and ceiling of the former are of zig-zag formation so as to avoid the reflection of sound waves, No. 3 being of normal type with unbroken wall surfaces, ceiling and floor. Of the two other somewhat smaller general purpose studios No. 5 is of conventional design, but No. 4 has non-parallel walls. The 14-in. brick walls which form the studios are entirely free from contact with the main building and the interiors are treated with building board which is also used for covering the floors underneath the felt and carpet. The only steel-work employed is in the ceilings.

The lighting of No. 2 studio is carried out by means of rectangular glass troughs (Harcourts, Ltd.), while the remainder are illuminated from Holophane flush panel fittings. Each studio has its own listening room separated from it by sound-insulated double windows, while huge electric clocks (Magneta) are provided.



The control room at the B.B.C.'s new studios at Maida Vale and (right) the B.B.C. Military Band taking part in a balance and acoustic test. (Note the zig-zag formation of the walls)

The B.B.C.'s recording rooms also are now centralised in the Maida Vale building, there being three rooms, each containing two Marconi-Stille steel-tape recording machines and three rooms each with two disc recording machines. Air-conditioning plant (Carrier) similar to that used for No. 1 studio has been installed separately for the new studios, the air being admitted through slotted ducts high up on the end walls and extracted through vents behind projecting baffle-plates about half-way up the walls.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Scottish C.W.S. to Make Lamps

We recently reported that the Scottish Co-operative Wholesale Society was considering the manufacture of electric lamps. Our Glasgow correspondent now informs us that the Society has decided to set up an electric lamp factory in Scotland at a cost of approximately £60,000. It is estimated that the production of lamps will be nearly 1,500,000 per year, but the factory will have double that capacity. The new factory will work in the closest collaboration with the Swedish Co-operative "Luma" Factory, and a trading arrangement between the two organisations is being completed. While no definite agreement has been reached between the two British Wholesale Societies, it is expected that part of the English C.W.S. requirements will be met by the Scottish factory.

E.L.M.A. Exhibition at Charing Cross

For a fortnight beginning on November 4th, the E.L.M.A. Lighting Service Bureau is holding an exhibition at Charing Cross Underground Station. The chief feature will be the large light-sight tester in which it is hoped thousands of people will discover for themselves the amount of light they require for comfortable seeing. To each of these a ticket will be issued, stating the amount of light they have chosen. The stand will also include several of the new study lamps. These will be on view to the public for the first time, and lighting experts will be available to explain the benefits of these new fittings. Mr. R. O. Sutherland, A.R.I.B.A., the architect to the Bureau, is responsible for the general design.

A display of Smith's electric clocks at British Industries House

Australian Tariff Board

The *Board of Trade Journal* reports that an application has been made to the Australian Tariff Board for increased duties on static transformers at voltages below 66,000 and between 10,000 and 20,000 kVA. The present duty on these transformers is 46 per cent. *ad valorem* British preferential tariff and 65 per cent. *ad valorem* general tariff, reduced by 0.009 for each kVA above 10,000 kVA.

Materials for Electrical Work

The latest addition (AA7) to the publications in the series of "Recommended Materials," issued gratis by the Mond Nickel Co., Ltd., gives the percentage composition of alloys for various constructions employed in the generation and distribution of electricity. Diesel engines are excluded as they are dealt with in a separate brochure (AA4).

Works Visit

On October 16th a party of about eighty of the London Branch of the Electrical Association for Women visited the works of the Hewittic Electric Co., Ltd., and the Hackbridge Electric Construction Co., Ltd., at Walton-on-Thames. The party, which included Mrs. Bentham (chairman), Miss V. Brice (hon. secretary), Mrs. A. T. Dover (hon. treasurer), Miss Minoprio (Principal, London School of Electrical Domestic Science), and Mr. A. T. Dover (Head of the Electrical Department, Battersea Polytechnic), was received by Mr. W. W. Hughes, managing director, and Mrs. W. W. Hughes. In the Hackbridge factory an exhibit had been arranged showing transformers in various stages of production. Considerable interest was shown in the winding of one of the coils for a 93,750 kVA transformer, which will be the third Hackbridge unit of this size to be installed at Barking power station. The core and coils of a 30,000-kVA, 132-kV transformer for the C.E.B. and various other large units, were also inspected. A high voltage demonstration was given in the Test Department and push-button operated on-load tap changing gear was shown in operation. An interesting part of the visit to the Hewittic Co.'s works was the inspection of the manufacture of large rectifier bulbs. An exhibition was also arranged to indicate the course of manufacture. After the visit the party took tea in the company's canteen. A vote of thanks to the companies was moved by Mrs. Bentham. After tea films were shown indicating the difficulties of transporting a large transformer from the Hackbridge works to Barking, and the manufacture of rectifier bulbs.

British Trade Mission to Poland

A *Reuter* message from Warsaw reports that the Mission, whose object is the improvement of trade relations between Great Britain and Poland, will arrive in Warsaw on Sunday next. The Mission includes Mr. C. Ramsden, of the Federation of British Industries, Mr. Lyall, of the Department of Overseas Trade, and a group of British manufacturers.

An Electric Clock Display

In the accompanying illustration we show an effective display which has been arranged by Smith's English Clocks, Ltd., and its associated companies in one of the showwindows of British Industries House, Marble Arch, W. The company has also prepared an attractive display stand for stockists which, carried out in mottled silver and black, provides an excellent background for three selected designs of the company's clocks.

A Buyers' List for Ironmongers

We are informed by the Electrical Section of the Ironmongers' Federated Association, Inc., that, with a view to assisting members in buying electrical goods, the hon. secretary proposes to prepare a buyers' list, giving a preferential list of manufacturers and wholesalers who actively support the work of price protection and who are especially commended for goodwill to retailers. There is, at present, an agitation for the elimination of domestic electrical appliances which are not safe and suitable for the purpose for which they are intended. The producers of these unsafe appliances will not be included in the list, and only those manufacturers whose goods are fully guaranteed will be considered. Manufacturers will be invited to submit their names and the types of appliances which they make, together with the terms they are prepared to offer to ironmongers.

Engineers' Wages

Workers in the engineering and allied trades in Derby on October 27th decided to accept the employers' offer of 1s. per week increase in the local standard rate of wages, in view of the fact that negotiations are pending for a further national advance. The number of men affected is 8,000.

Report on the Poplar Strike

A special committee has reported to the Poplar Borough Council upon the causes of the strike which occurred in the Installations Department of the electricity undertaking a few months ago. It appears from the report that the men alleged that offensive language and threats were employed by a foreman. The committee thinks that this matter has been exaggerated and actually nobody was dismissed for the cause given. It is admitted that there was some delay in the delivery of materials; but this was attributable to the rapid growth of the undertaking. The committee denies that any attempt was made to fix task work on the men, and says that the bad atmosphere created by a squabble about trade union membership led to many exaggerated charges into which the committee was not called upon to enter. The Council endorsed the committee's findings at its meeting on October 25th.

New Municipal Showrooms

The Willesden Corporation has received sanction from the Electricity Commissioners to the raising of a loan for the erection of central electricity showrooms and offices. Specifications will shortly be issued for tenders for the erection and equipment of the building.

German Lamp Production

The Institute for Economic Research reports that the production of electric lamps in Germany has increased with the economic improvement of the country. During the year 1932-33 the production of 61.4 million lamps was the lowest since 1924-25 and compared with a maximum of 98.7 million lamps in 1928-29. In 1933-34 the output rose again to 67.5 millions and a further advance took place in the year ended March 31st last. In the case of sales, on which tax is levied, the number sold increased from 62.9 million lamps in 1933-34 to

75.5 millions in 1934-35, the latter being the largest turnover in the past ten years.

Restrictions Upon Italian Trade

The Department of Overseas Trade calls attention to the Treaty of Peace (Covenant of the League of Nations) Order-in-Council, of October 25th, 1935, of which the text is published by H.M. Stationery Office. (Reference number S.R.O. 1038/1935, price 2d.). The Order-in-Council prohibits as from that date the export of certain goods to Italian territory, and as from a date to be appointed by the Board of Trade the export of certain other goods. For full particulars of these two classes of goods reference should be made to the text of the Order. Broadly speaking the first list includes munitions of war, while the second list covers raw materials of various classes and transport animals. The Board of Trade is further empowered to order a date upon which prohibition may be made of the importation of Italian goods. No order has been issued bringing this prohibition into force.

Advertisement Correction

In the announcement which appeared on page 5 of our Advertisement Supplement last week the name of one of the companies was given as Crypto Equipment Co.; this should have been Crypton Equipment, Ltd.

The Building Trades' Exhibition, Birmingham

At the Building Trades' Exhibition, which was held in Bingley Hall, Birmingham, from October 15th to 26th, the Birmingham Corporation Electric Supply Department had a stand which was devoted primarily to the display of all kinds

The stand of the Birmingham Electric Supply Department at the Building Trades' Exhibition

of electrical appliances for the home, especial features being made of model kitchens and bathrooms. A number of designs of electric fires, cookers, water heaters, refrigerators and vacuum cleaners were shown, and the stand aroused a good deal of interest.

A Colliery Visit

Members of the English Electric Stafford Works Engineering Society recently paid a visit to the Coventry Colliery. This colliery is the largest and deepest in Warwickshire and is situated at Keresley, four miles from the centre of the city. Members descended to a depth of 720 yd. and then walked and crawled to the coal face, a distance of 2¼ miles. Ventilation is effected by a large fan capable of circulating 350,000 cu. ft. of air per minute into the mine. There is also a stand-by fan to be used in an emergency. On coming to the surface again the party inspected the power house, winding engine house and screening plant. They also saw the social services provided for the miners, including the pithead baths which provide accommodation for 1,890 men, a canteen, park and sports ground. Members partook of light refreshment in the canteen and the proceedings terminated after Mr. W. E. Milton-Ayres, vice-president of the Society, had called for a vote of thanks to Mr. W. Fenn, general manager of the Colliery, and to all the officials for their courtesy in granting facilities for the visit.

Control in the Danish Radio Industry

Our Copenhagen correspondent reports that the Danish radio manufacturers have formed a pool, incorporating all those firms who have made contracts with representatives of holders of vital radio patents. The new organisation, which is called the Dansk Radio Union, has thirty-eight members. It has taken control of the whole market by placing the patentees under an obligation to reject all future demands of newcoming manufacturers for patent contracts. Their next move was to reorganise the trade on new principles, chiefly by means of a general declaration which retailers have been compelled to sign. The declaration prescribes the absolute maintenance of fixed prices under severe penalties by arbitration. Strict rules are also provided on a standard basis for sales on deferred terms; it is decreed that no receiver may be sold unless a minimum of 10 per cent. of the sales price is paid in cash. Payment, regardless of price, must be completed within ten months from the date of purchase. Second-hand receivers may not be accepted as part of the first instalment, and the allowance for used sets more than two years old may not be more than 10 per cent. of the sale price of the new receiver. All unpaid service, except the usual instructions for the use of a new receiver, is prohibited. The retailers have complained to the Government, claiming that the agreement constitutes an infringement of the Anti-trust Acts.

Orders Recently Booked

British Insulated Cables, Ltd., has recently built for the Northern Ireland regional transmitting station of the British

B.I. condensers for the Northern Ireland Regional transmitting station

Broadcasting Corporation a bank of 1μF. condensers rated for continuous operation at 20 kV. The bank, part of which is illustrated in the photograph, is a repeat order, as a similar 20-kV bank was built by the B.I. eighteen months ago for the Droitwich long-wave station.

Recent installations of the "Whiteway" picture lighting of Messrs. W. R. White & Co. include that at the exhibition of French drawings in the galleries of Robert Frank, Ltd., 20, Bruton Street, W.1, and Messrs. Pulman's new gallery in Thayer Street. A number of the exhibits at the Antique Dealers' Fair have also been lighted by this system.

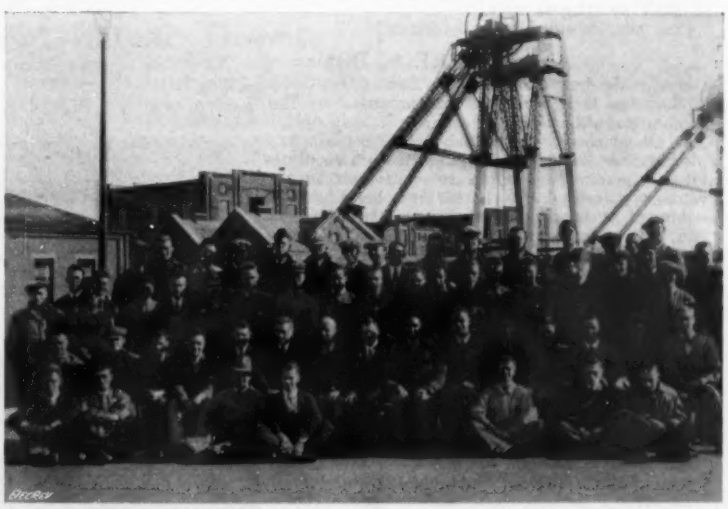
Calendar

The "Exide" calendar for 1936 has monthly sheets each of which has a fine marine study from the brush of Norman Wilkinson, R.I., with a title appropriate to "Exide" and "Drydex" batteries.

Trade Announcements

The Reading branch of Walsall Conduits, Ltd., has been removed to "Walsall House," 50, King's Road, Reading. The new premises will include a showroom for the display of the company's conduit, conduit fittings and ironclad products, and of "Walglow" electric fires, &c.

The British Electrical Corporation, Ltd., Aldwych House, Aldwych, W.C., informs us that it has taken over the patent rights and business of the Caldwell Thermo-Electric Engine Heaters & Battery Chargers, late of Mansfield and Nottingham. The engine heater was referred to by Mr. G. E. Moore in his article on "Electricity in the Garage," in our issue of October 11th.



Members of the English Electric Stafford Works Engineering Society at Coventry Colliery

Messrs. Allen West & Co., Ltd., have removed their Birmingham office to 117, Dale End, Birmingham, 4 (telephone: Central 8060). Mr. L. O. Cartmel remains in charge.

Social Events

The first dance of the season of the Veritas-Efesca staff (Messrs. Falk, Stadelmann & Co.) was held recently at the South Victoria Hall, Bloomsbury Square, W.C., in aid of the Sports Club. Several members of the Executive attended, including Mr. Max Falk, Mr. L. Thurner, Mr. Gustav Falk, Mr. Geoffrey Falk and Mr. Soudal. A letter was read from Mr. Hugo Falk, who was in the North of England.

Despite the late start of the sixth annual swimming gala of the Henletel Swimming Club it may truthfully be said that the evening "went swimmingly." There was a very full programme of events, which followed one another without a hitch, not the least interesting being the Inter-Association ladies' water polo match. The City Livery Cup was this year won by the Woolwich Branch. A new cup has been presented by Lady Hughman to be competed for by the ladies of the club. At the conclusion of the events the prizes were distributed by Lady Simpson.

The Fortune Theatre was crowded on Monday and Tuesday last for the two performances of "The Last of Mrs. Cheyney," presented by the G.E.C. Dramatic Society. This play calls for more than average ability and particularly for strong team

The G.E.C. Players in a scene from "The Last of Mrs. Cheyney"

work, qualities with which the Society is well endowed. Mr. D. G. W. Acworth as "Charles" (a butler), Mr. Eric Wynne Roberts as "Lord Willing," and Miss Sheila Cooper as "Mrs. Cheyney," in the principal roles, gave sterling performances, but their tasks were made easier by the excellent support given by the remainder of the cast. Mr. Acworth's interpretation was so good that we were surprised to learn from Mr. Robert Mitchell, the producer, that he had only taken the part at short notice. The reception of the play was enthusiastic. The two performances were given in aid of the Electrical Trades' Commercial Travellers' Association charities, and on Monday evening, Mr. Acworth, in thanking the audience for its reception of the play, welcomed Mr. Max Falk, president of that Association, and Mr. M. J. Railing, president-elect.

For Sale

Southampton Corporation has for sale a 1,500-kW turbo-alternator, together with condenser and pumps.

Felixstowe Electricity Department has for disposal a 22,000-V switchgear unit.

(See our classified advertisements.)

A London J.E.A. Display

By far the best exhibit at the Public Health Exhibition held at Surbiton last week was that arranged by the London and Home Counties Joint Electricity Authority. The closed stand was built by the Authority's own staff and in quite a small space practically all of the domestic applications of electricity were represented. A bath and hand-basin equipped with water-heating apparatus, towel rail, &c.; examples of electric fires and lighting fittings; and cooking and labour-saving equipment were features of the display. The cooking demonstrations given by the Authority's staff twice daily drew "full houses." Attractive publicity matter containing details of the charges, assisted wiring schemes and hire and hire-purchase arrangements was available at the stand and members of the staff were in attendance to answer questions. Many inquiries were received and we are told that already a satisfactory amount of business has resulted.

Messrs. Beatty Bros., Ltd., had a stand on which they showed examples of their washing and ironing machines in operation, and "Servis" washing machines (Messrs. Wilkins & Mitchell) were also displayed.

The London J.E.A.'s stand at the Surbiton Health Exhibition

An Aircraft Wireless Establishment

The development which has taken place in aircraft wireless business has made it necessary for the Marconi Co. to create a new organisation, known as the Marconi Aircraft Wireless Establishment, in which will be centred all activities concerning the development, design, and manufacture of all kinds of aircraft wireless apparatus. This establishment has just been opened at Wandle Road, Hackbridge, Surrey.

French Electrical Imports and Exports

The appended tables show the values of the French imports and exports of electrical machinery during the six months ended with June last as compared with the corresponding half of 1934. The values are given in thousands of francs, while for purposes of comparison the total sterling value at the current rate of exchange of about 74½ to the £ is also given.

	Imports. January–June, 1934. 1,000 Fr.	1935. 1,000 Fr.
Dynamo-electric machines, transformers, and parts	24,429	17,155
Telegraph, telephone, and other electric apparatus	87,390	69,054
Incandescent lamps and radio valves	28,364	19,458
Arc lamps and parts	65	54
Carbons for electric and industrial purposes	3,121	3,215
Electric wires and cables	16,958	2,244
Parts of electric apparatus, and magnets, other than electro-magnets	10,507	9,168
Accumulators and parts	1,354	786
Dry batteries and condensers	6,139	10,136
Porcelain and other insulators	1,358	809
Total 1,000 Fr.	179,585	132,079
Total at 74½ francs to the £	£2,410,537	£1,772,872

	Exports. January–June, 1934. 1,000 fr.	1935. 1,000 fr.
Dynamo-electric machines, transformers and parts	21,017	13,162
Telegraph, telephone, and other electric appliances	42,159	49,450
Incandescent lamps and radio valves	10,042	6,927
Arc lamps and parts	88	41
Carbons for electric and industrial purposes	7,177	6,002
Electric wires and cables	10,025	12,177
Parts of electric apparatus and magnets, other than electro-magnets	9,080	5,374
Accumulators and parts	6,015	5,466
Bry batteries and condensers	1,162	1,194
Porcelain and other insulators	4,565	3,303
Total 1,000 Fr.	111,330	103,096
Total at 74½ francs to the £	£1,494,483	£1,395,919

It will be seen that the half year's imports show a decrease of no less than £637,665, or over 26 per cent. Of the items scheduled in the table only two show an increase, while decreases are shown in eight, the most noticeable, perhaps, being that in respect of wires and cables. The exports of electrical material from France also show a decrease of £98,564.

Prices of Materials

Messrs. Henry Gardner & Co., Ltd., report October 30th: No change in the price of copper bars (best selected), sheet and rod. English pig lead, £19 15s., 5s. inc. Spelter, £16 5s., 5s. inc. English block tin, £222 10s., 10s. dec.

Messrs. Frederick Smith & Co. report, October 30th: No change in the price of electrolytic copper bars, wire rods and h.c. wire and silicium bronze wire.

Messrs. Edward Till & Co. report, October 30th: India rubber, Para fine, 5¾d., ¼d. inc.

New Revo Boiling Plates

The Revo Electric Co., Ltd., tells us that it is shortly introducing a new type of boiling plate which has been designed to give efficient extra rapid heating and simmering. The latter is provided for without the use of an external resistance and the plate is controlled by a four-heat switch. At first two sizes—8 in. and 8 11/16 in.—will be available.

The Norwich Tramways

Messrs. E. J. Walsh & Co., 15, St. James Square, Edinburgh, inform us that they have purchased all the plant, including tramcars, poles, rails, overhead wire, &c., from the Norwich Tramway Co. They have bought everything as it stands and they are to carry out the dismantling and removal.

New Norwegian Cable Factory

A cable factory which is being erected in Norway bears the name of the Kabelfabrikken Fortuna. The factory is to be established in Drammen with a share capital of 200,000 kr.

New Catalogues and Lists

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A pamphlet on the type "HH" automatic oil-immersed circuit-breaker for heavy duty. Also a description of the Warren fault locator for overhead lines.

Rawlplug Co., Ltd., Cromwell Road, S.W.7.—A leaflet dealing with a new "Rawlplug" tool.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.2.—An illustrated descriptive booklet on "Escura" electric-discharge lamps.

Henry Simon, Ltd., Cheadle Heath, Stockport.—A leaflet relating to automatic weighing.

Fuller Electrical Mfg. Co., Ltd., 5, Chancery Lane, W.C.2.—A coloured leaflet on induction motors.

English Electric Co., Ltd., Stafford.—Illustrated booklets on Diesel-electric shunting locomotives, a.c. arc welding equipment, metal-clad switchgear and mixed pressure steam turbines. Detailed technical descriptive matter is included in each case.

Falk, Stadelmann & Co., Ltd., 83, Farringdon Road, E.C.1.—A catalogue (No. 711) of "Efesca" lighting units for interior and exterior use.

D.P. Battery Co., Ltd., Bakewell.—A booklet on "Kathanode" traction cells, showing trucks and locomotives operated by these batteries, and another on "Dualode" batteries for commercial vehicles.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—A card drawing attention in graphic manner to the "Marine" type of motor control panel.

Attwoods (Factors), Ltd., Attwood House, Fryer Street, Wolverhampton.—A pocket price list for electrical contractors and traders.

Sun Electrical Co., Ltd., 118, Charing Cross Road, London, W.C.2.—A supplementary catalogue of radio valves and batteries.

Switchgear & Equipment, Ltd., Delavox Works, Banbury.—The first issue of "Contact," a periodical publication.

Bankruptcy Proceedings

North End Radio (a firm), wireless factors, 250B, North End Road, Fulham.—The creditors under this failure met on October 22nd at London Bankruptcy Buildings. It appeared that one David Green had attended under the proceedings and had stated that he began the above business in March, 1933, with a capital of £100, a gift from his mother. From September, 1933, to March, 1934, he was absent through illness, and the business was left in the care of a manager. Owing to lack of capital and inability to obtain proprietary goods, through having been placed on the stop list of a radio trade association, he was unable to carry on and an offer of a composition of 5s. in the £ having been rejected by the petitioning creditor, these proceedings were instituted. The failure was further attributed to keen competition. The case was left in the hands of the Official Receiver.

K. F. Butcher, radio dealer, trading as The Radioelectric Company, lately of The Parade, Welling, and Well Hall Road, Eltham.—The public examination of this debtor was held on October 23rd before Mr. Registrar Mellor, at the London Bankruptcy Court, the accounts showing total liabilities £1,195 (ranking £186) and assets £13. Debtor attributed his insolvency to heavy overhead expenses, to decline in trade owing to competition, and to the takings of the Eltham business not having fulfilled anticipations. The examination was concluded.

A. Roberts, 73, Church Street, Gainsborough, Lincs, electrical and radio engineer.—The public examination of this debtor was held recently at the Municipal Buildings, Boston. The statement of affairs filed showed gross liabilities of £878, of which £835 was expected to rank for dividend, and there were estimated assets of £147. Debtor attributed his failure to decline in trade, lack of capital, and bad debts. He was ordered to produce a trading account, and the examination was adjourned.

B. A. E. Hinkins, 322, Torquay Road, Paignton, radio dealer.—This debtor attended at the County Court Offices, Old Town Hall, Torquay, on October 24th for his public examination. He had returned a statement of affairs which showed a deficiency of £324. Debtor said that the district was not a good business centre, and he attributed his failure to the poor situation of the shop, lack of free capital, and high rent and overhead expenses in relation to the turnover. The examination was concluded.

R. L. D. Mathews, 24, Kingsway Road, Burnham-on-Sea, Somerset, wireless and electrical engineer.—This debtor filed his own petition recently and according to the statement of affairs there are liabilities of £229 and assets of £79, leaving a deficiency of £150. Debtor attributes his failure to lack of capital, competition and bad debts.

L. W. Perrem, wireless engineer, 20, Tavistock Road, Launceston, Cornwall.—Receiving order made October 21st on debtor's own petition.

H. H. Baron, electrician, 84, Duckworth Street, Darwen.—Last day for receiving proofs for dividend November 9th. Trustee, Mr. A. H. Ward, District Bank Chambers, Blackburn, Official Receiver.

F. Stead, wireless dealer, 1, Manchester Square, Otley.—First and final dividend of 1s. 7¼d. in the £, payable November 8th at 24, Bond Street, Leeds.

Company Liquidations

Anti-Vibration Electric Lamp Co., Ltd., 40, King William Street, E.C.—Under the compulsory liquidation of this company accounts have been lodged showing total liabilities of £4,038, made up of unsecured debts, £1,958, preferential claims, £29, and loans on debentures, £2,050; the assets, valued at £996, are absorbed in the preferential and debenture claims, and the deficiency is estimated at £3,043, the issued capital consisting of two ordinary shares of £1 each. The Official Receiver (who is also acting as liquidator) reports that the company was promoted in April, 1922, to carry on the business of manufacturers, exporters and importers of and dealers in electrical, gas and lighting goods and accessories of every description. The promoter was C. V. Radeglia, who states that the principal object of the company was to acquire an agency agreement for the sale of electric lamps from N. V. Vereenigde Industrieen, Rotterdam, and that practically the whole of the company's business was confined to the sale of lamps supplied under the agency which terminated on June 30th, 1933. Debentures for £2,000 were issued in 1923 and 1928, and on June 30th, 1933, the debenture holders appointed Mr. J. H. G. Peterken, I.A., as receiver to take possession of the assets. In July, 1933, litigation arose between this company and the V.I.R. company, with the result that on November 1st, 1934, judgment for £335 was obtained by the V.I.R. Company. The failure of the company is attributed by Mr. Radeglia (1) to the termination of the agency for the V.I.R. Company; (2) to the injunction obtained by that company restraining the sale of lamps, and (3) to the costs and charges incurred by reason of the legal actions brought by the V.I.R. company.

Radiant Display, Ltd.—Winding-up voluntarily. Liquidator, Mr. G. D. Haynes, 93, Mortimer Street, W.1.

S. Dagnall, Ltd.—Winding up voluntarily. Liquidator, Mr. F. E. Bendall, 4, Warwick Passage, Corporation Street, Birmingham.

Peacock Radio, Ltd.—Particulars of claims by November 29th to the liquidator, Mr. G. M. Davies, 28, Rutland Street, Swansea.

A Lamp Patent Dispute

IN the Court of Appeal consisting of Lords Justices Greer, Romer and Scott on Monday last, the British Thomson-Houston Co., Ltd., appealed from an interlocutory order of Mr. Justice Farwell in the Chancery Division dated October 8th, giving the defendants in the action, Crompton Parkinson, Ltd., leave to re-amend their particulars of objections, the British Thomson-Houston Co. having taken objection to the form of the amended particulars which the defendants proposed to put in.

The plaintiffs' action was for an injunction (and ancillary relief) to restrain the alleged infringement of the plaintiffs' letters patent for a process for frosting electric lamp bulbs. The defendants alleged that the plaintiffs' invention was not new by reason of prior user and that prior to the date of the plaintiffs' letters patent (February, 1925) frosted glass bulbs had been manufactured in Austria and imported into this country and that bulbs identical with the bulbs manufactured by the plaintiffs had been regularly made in this country.

Mr. Justice Farwell, in the Court below, said that the plaintiffs' claim in their specification was obviously made in a very wide form and in the circumstances he was of opinion that the defendants ought to have leave to re-amend their particulars of objections. From this order the British Thomson-Houston Co. now appealed.

Mr. Whitehead, K.C., for the appellants, said that this was a patent action and it was not an uncommon thing for the defendants in such actions to attack the validity of the patent concerned. In such actions where the defendants set up as a defence such matters as prior publication and prior user the defendants under the rules had to give particulars with regard to those pleas. In the present case the defendants delivered their defence and particulars of objections and subsequently they obtained leave to amend their particulars of objections and then later they obtained leave further to amend their particulars by adding one more to the list of alleged prior users and Mr. Justice Farwell made an order giving such leave. He (Counsel) submitted that the amendment proposed and the amendment which the judge allowed did not comply with the rules. The invention with which the plaintiffs' patent was concerned was to bring the globes or bulbs up to the strength which the glass had previous to the frosting. At the present moment the plaintiffs under the orders made would have to investigate or make inquiries into upwards of 300 cases of alleged prior user which the defendants had set up. He submitted that the order of Mr. Justice Farwell should be set aside.

Sir Stafford Cripps, K.C., supported the order of Mr. Justice Farwell on behalf of the respondents. He said that the defendants by the re-amendment in question wished to have added to the list of prior users in their particulars the name of a certain firm who had been carrying on business in articles which came within the ambit of the plaintiffs' claim for many years.

In giving judgment Lord Justice Greer said that in his opinion Mr. Justice Farwell came to the right conclusion. The plaintiffs' claim was a very wide one involving a process for frosting glass and also to do something afterwards. But before the trial came on it might be a useful and reasonable thing for the defendants to give some further information of what were the incidents on which they relied as justifying their defence, not because they were obliged to do so but because it was quite conceivable that they might otherwise subject themselves to some penalties if they did not distinguish their prior user with more particularity than they had done.

The other members of the Court concurred and the appeal was accordingly dismissed with costs.

Electricity Supply

Lighting, Domestic, Power

Barnsley.—ELECTRICITY AIDS SHOPPING CAMPAIGN.—More than 20,000 coloured lamps and other attractive electrical devices are being used to brighten the streets of Barnsley during the "Shop in Barnsley" fortnight, which ends this week.

Barrow-in-Furness.—LOAN FOR METERS.—The Electricity Committee is seeking sanction to borrow £5,000 for meters.

Basingstoke.—EXTENSIONS.—To meet the cost of providing a supply to the Overton pumping station the Electricity Committee is applying for sanction to a loan of £1,200. In addition, a new underground main at Kempshott (£950) and an overhead line near Park Lane (£300) are proposed.

Biddulph Moor (Staffs).—STREET LIGHTING.—Last week fifty street lamps were switched on along three sections of the road from Knypersley to Biddulph Moor, which is 1,000 ft. above sea level. The work was carried out by the North West Mid-

Three recent electric-discharge lighting installations: — Top: Dewsbury bus station. Centre: Queen's Drive, Liverpool. Bottom: Townhead bus depôt, Sheffield

lands Joint Electricity Authority, the chief engineer and manager of which is Mr. F. Favell.

Campbeltown. — QUICK WORK. — On October 23rd a supply of electricity was switched on from the Campbeltown and Mid-Argyll Electric Power Company's new generating station. It is claimed that the rapidity with which the power house has been erected and the street cables laid constitutes a record for such a scheme, as it was only in July last that Parliamentary authority was obtained to proceed with the work. Ultimately the company will supply the whole of Mid-Argyll and Kintyre, and another power house is to be erected at Ardrishaig to supply the Lochgilphead and Tarbert areas. The engineer for the scheme is Mr. J. Sharples.

Canada.—A LARGE HYDRO-ELECTRIC PLAN.—*Reuter* reports from Toronto that Mr. T. S. Lyon, chairman of the Ontario Hydro-electric Commission, has announced that a power development project involving the diversion of rivers and the creation of a new lake to the north of Lake Superior will be placed before the new Government for approval. It is estimated that a 392,000-h.p. development is possible.

Carlisle.—LOWER CHARGES FOR CINEMAS.—Having considered an application by cinema and theatre proprietors for cheaper supplies, the Electricity Committee has adopted the following new scale: Up to 80 kWh per week, 3d. per kWh; from 80 to 580 kWh, 2d.; over 580 kWh, 1d.

Cheltenham.—SUPPLY TO ESTATE.—The Electricity Committee has obtained sanction to borrow £1,492 for providing a supply to the Arle Court estate.

Dartford.—EXTENSION TO ESTATES.—Various housing estates in the vicinity are to be supplied with electricity, the cost of the work being estimated at £1,500.

Dolgarrog.—NEW GENERATING SET.—The electricity commissioners have given their consent to the installation of a new 6,500 kW generating set at the Dolgarrog power station during the coming winter.

Earby.—REDUCED DOMESTIC TARIFF.—As from October 1st the first 50 kWh of electricity consumed in the winter quarters under the domestic scale has been reduced from 1d. to ¾d. per kWh, and the first 100 kWh per quarter under the lighting scale for churches, schools, shops, public halls, offices, &c., from 5½d. to 5d. per kWh. Power charges are also modified. These reductions are the fifth since the undertaking started in 1929.

A THOUSAND CONSUMERS.—Such good progress has been made that the number of consumers has now topped the thousand mark, and in recognition of this achievement a complete record of the undertaking has been prepared, starting from 1925 when the Urban District Council decided to contest the application of the Electrical Distribution of Yorkshire, Ltd., for power to supply the area. According to the 1931 Census the population of Earby was 5,522.

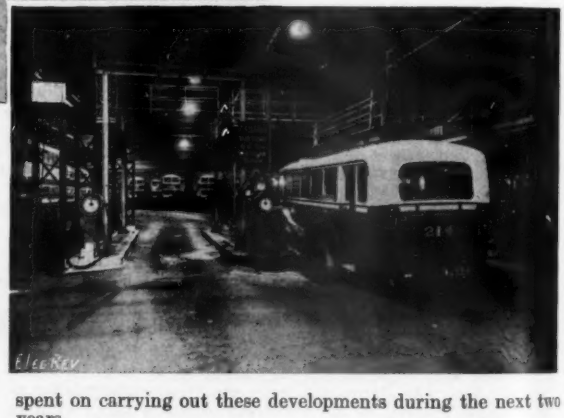
Edinburgh.—SODIUM STREET LIGHTING.—It is proposed to extend the street lighting from the tramway terminus at Braid Hills to Fairmile Head at an estimated cost of £1,500. As an experiment six sodium lamps are to be installed.

France.—FOUR UNDERTAKINGS AMALGAMATE.—Four French electricity supply undertakings have been merged to form the Société Bretonne d'Interconnexions, which has a capital of ten million francs. It will thus be possible to link up a number of large power stations in Brittany.

ELECTRIC POWER DEVELOPMENTS.—A message from our Paris correspondent states that the Government has approved of power plants being built on the Portillon fall of the River Neste d'Oô (4,500 ft.) and a fall of about 3,640 ft. on the River Lys.

Great Britain.—MORE ELECTRIC-DISCHARGE LIGHTING.—Recent applications of electric-discharge lighting include both outdoor and interior illumination. One of the many new street-lighting installations utilising the system is that at Queen's Drive, Liverpool. Here 100-W Philips' "Philora" sodium lamps are used, with "Wardle Solux" directive units of the "Liverpool" pattern, mounted 22 ft. high and 120 ft. apart. The installation was carried out under the direction of Mr. P. J. Robinson, the city electrical engineer. At the Dewsbury bus station of the Yorkshire Woollen District Transport Co., Ltd., "Mazda Mercra" lamps are used to good effect in B.T.H. "Circra" lanterns, while a new installation at the Townhead bus depôt of the Sheffield Corporation Transport Department consists of twenty-four 400-W "Osira" lamps in G.E.C. industrial reflectors, giving a total load less than half that of the filament-lamp installation which it superseded.

Hungary. — RATIONALISATION AND DEVELOPMENT.—A big electrification plan is being prepared in Hungary with the co-operation of the Government. The object is to bring about a better division of supply areas and to accelerate development. In some districts as much as ten million pengoes is to be



spent on carrying out these developments during the next two years.

Italy.—ELECTRICITY SUPPLY PROGRESS.—The August issue of *L'Energia Elettrica* contains the annual report for 1934 on the progress of electricity supply in Italy compiled by the Director of the Italian Unione Nazionale Fascista Industrie Elettriche. The return is based on reports from 1,667 private electricity supply undertakings and 65 partly private and partly municipal concerns. A feature of the year was the continued amalgamation of power supply undertakings. At the end of the year water power concessions had been granted to the extent of a total of 6,317,778 h.p., the actual hydro-electric plant installed having increased from 3,387,357 h.p. to 3,396,879 h.p., divided among 950 power stations (an increase of fourteen during the year). The aggregate output of the hydro-electric power stations amounted to 11,560 million kWh as compared with 10,724 million kWh in 1933, an increase of about eight per cent. In addition, a certain amount was imported from Switzerland. In contrast to the increase in hydro-electric output there was a decrease in the output of power at the steam and internal-combustion-engined stations from 338 to 324 million kWh.

Japan.—NEW POWER STATIONS.—The last power station which is to be built under the Japan Power Co.'s scheme is No. 3, Kurobe station, rated at 70,000 kW. Construction is to begin at once. A 25,000-kW station is shortly to be constructed by the Tokyo Electric Light Co. on the Ono River, Fukishima.

Keith.—PLANS FOR STREET LIGHTING.—Following the recent plebiscite, which resulted in 375 ratepayers voting for electric street lighting as against 37 for gas, the Town Council has decided that centrally suspended 200 W directional refractory lamps shall be provided in two main roads, and that electric-discharge lamps shall be erected at important points. Other streets are to be lighted by lamps of not less than 100 W, suspended from pillars. The contract for the lamps and fittings is to be given to the Grampian Electricity Supply Co.

Kent.—According to the *Financial Times*, the Kent Electric Power Company intends to apply for a Special Order providing for the suspension of the rights of the Chatham and Rochester Corporations to purchase the parts of the undertaking authorised by the Chatham-Rochester Order, 1890, until August 14th, 1974, but allowing the Corporations, within six months after August 14th, 1953, by notice in writing, to require the undertakers to sell to the Corporations their undertaking on payment of the fair market value of the undertaking as a going concern.

Kettering.—FLOODLIGHTING FOR THE ROYAL WEDDING.—For the Royal wedding on November 6th lighting schemes will form a major part of the celebrations. Hundreds of coloured electric bulbs are to be festooned along the route to Boughton House, where the honeymoon is to be spent, and a floodlighting scheme will embrace all the principal buildings. An electrically illuminated fountain will also be in operation.

Kingston-upon-Thames.—NEW DOMESTIC TARIFF.—To provide a cheap supply of electricity to slot meter consumers a new domestic all-in tariff has been introduced. The charge will be 1d. per kWh (instead of 3½d.) and will apply to consumers using 1,040 kWh per year; in addition, a cooker and kettle will be supplied, installed and maintained free of charge. Consumers at present under the assisted wiring scheme can also use this tariff by paying 1½d. per kWh. No meter rental is charged.

London.—BERMONDSEY.—The Electricity Committee recommends that a consumer who has paid the rental charge for a radiator for seven years shall be allowed to retain it as his own property.

ISLINGTON.—Last week we stated that reductions in charges were proposed, and Mr. A. P. MacAlister, the borough electrical engineer, now informs us that the Borough Council has decided to institute a lighting flat rate of 2½d. per kWh for all consumers, including public buildings, institutions, &c. Shop-window lighting after hours is to be 1½d. per kWh, and the rate for rental wiring consumers (including rental) will be 4½d. per kWh; for prepayment meter supplies the charge is to be 3½d. per kWh. The reductions come into force at the end of the December quarter.

HACKNEY.—It is proposed to modify the domestic tariff by basing the standard charge on the dimensions of occupied premises and reducing the " unit " charge from ¼d. to ⅛d. per kWh. About 34,000 consumers are affected.

POPLAR.—The Electricity Committee is to introduce uniformity in street lighting and replace side-street lighting columns. The change is estimated to cost £600 a year.

A repair workshop for cookers and domestic apparatus is to be built for the Electricity Committee at a cost of £6,100. The total number of cookers connected is 2,400, and additional cookers are being installed at the rate of fifty per week.

ST. PANCRAS.—The Electricity Committee is to extend mains and provide a sub-station in University Street to supply a cinema, shops, 119 flats and an extension of the University College Hospital being erected in Tottenham Court Road. Sub-stations are also to be built in Britannia Street (£2,839) and South Grove (£1,892).

Street lighting in Albany Street is to be improved at a cost of £3,660.

SOUTHWARK.—The Electricity Committee is seeking sanction to borrow £12,000 for mains extensions, and is to install free wiring at a cost of £2,013. It has prepared plans for alterations and extensions costing £6,712 at the electricity station.

Utilisation of the existing steam plant for generating electricity this winter during the peak-load periods is recommended by the Electricity Committee, which reports that if such partial generation were resumed the cost to the Council would be £7,000 less than if the whole supply were taken at prices fixed by the agreement. It is added that the City of London Electric Lighting Co., Ltd., is agreeable to the proposal.

Luton.—LOANS.—The Town Council has applied for loans of £50,000 for mains and services and £10,000 for meters.

Mountain Ash.—LIGHTING AT ¾D. PER KWH.—Mr. E. W. Jones, electricity manager, recently informed the Council that, as a result of the sound position of the undertaking, consumers would receive a bonus of 2½d. per kWh for the December quarter, so that the net rate would be ¾d. per kWh as compared with the normal rate of 2½d. Slot meter supplies would cost 1d. per kWh net (against 2½d. net), and assisted-wiring consumers 3½d. (compared with 5d. net). Mr. Jones said the position was very satisfactory. The amount of energy purchased during the six months ended September 30th last was twelve per cent. more than in the corresponding period of 1934, and, providing no serious slump occurred during the next six months, the financial results for the year ending March 31st, 1936, would show a substantial excess of receipts over expenditure.

Plymouth.—CHARGING VEHICLE BATTERIES.—The fixing of a charge of 0.68d. per kWh for electricity used for charging vehicle batteries has been recommended by the Electricity Committee. The tariff is restricted to the period from 8 p.m. to 8 a.m. At other times the charge is 0.85d. In addition a rental of 3s. 6d., or more, according to size, is charged for the two meters and time-switch.

Portsmouth.—ELECTRICITY UNDERTAKING AND THE RATES.—The City Council has rescinded a resolution passed in April providing for a contribution of 1½ per cent. of the outstanding capital of the undertaking being allocated to the relief of the rates out of the surplus of the undertaking.

Samlesbury (Lancs).—NEW RURAL SUPPLY.—About a month ago the work of extending the Lancashire Electric Power Company's mains in the district was put in hand, and last week the supply was inaugurated. The district covers more than 4,000 acres, with a population of little over 1,000, and about five miles of overhead and underground cable has been put into commission. According to the *Daily Dispatch*, there has been practically 100 per cent. response from householders, and already many electric cookers and other domestic apparatus have been installed.

South Shields.—CORPORATION AND THE GRID SCHEME.—At a recent meeting of the Electricity Committee the borough electrical engineer pointed out that the generating charges per kWh had been increased from 0.341d. in 1931, when the station was generating independently, to 0.437d. in the last year of working, when, as a result of the agreement with the C.E.B., it was generating for only three months. He therefore recommended that application should be made to the Board for a revision of the charges in accordance with the provisions of the Electricity (Supply) Act, 1935. It was decided that a deputation should interview representatives of the Board on the subject.

Stirling.—COUNCIL FAVOURS ELECTRICITY.—Recently the Lighting Committee considered whether electricity or gas should be used for the lighting of two thoroughfares, the capital cost being £653 and £337 respectively. On a vote it was decided to recommend gas lighting, but the Town Council reversed the decision and chose electricity.

Walthamstow.—ELECTRICITY CONCESSIONS.—The abolition of meter rents (except in the case of additional meters) has been recommended by the Electricity Committee, and also a reduction in the annual primary charge for scale C from 12½ per cent. to 10 per cent. of the rateable value. Under scale G a reduction in the kW charge from £3 to £2 10s. is proposed.

Wolverhampton.—LOAN.—The Electricity Committee is seeking sanction to borrow £10,000 for transformers and switchgear.

SUPPLY IMPROVEMENT.—The supply in the Low Hill and Hilton areas is to be improved at a cost of £5,812.

Worksop.—LARGE INDUSTRIAL DEVELOPMENT SCHEME.—Formal agreements were signed last week-end in connection with a proposed large industrial development scheme. Two companies are to be formed, one of which will purchase a site near Manton Colliery for a power station, which is to pass out the residue of its steam for sale to new industries for manufacturing purposes. The other company will manage the Corporation electricity undertaking, taking over the rights of distribution and the sale of electricity in the town.

Traction

Bath.—CORPORATION AND THE TRANSPORT SERVICES.—The Corporation is inserting a clause in its forthcoming Parliamentary Bill by which it seeks power to purchase the tram and motor services of the Bath Electric Tramways Co., Ltd., and the Bath Tramways Motor Co., Ltd., and, in the event of this being granted, to discontinue the tramway system and to run bus or trolley-bus services.

Blackpool.—FUTURE OF TWO TRAM ROUTES.—The Corporation Transport Committee is considering whether trams on the Central Drive and Layton routes should be replaced by buses, as the track is in need of renewal. The Corporation has power to run trolley-buses along both routes, but whether this system will be adopted has not yet been decided.

Darlington.—PROPOSED TROLLEY-BUS SERVICE.—The Town Council has decided to submit to the Ministry of Transport a scheme for running trolley-buses in Victoria Road, Imperial Corner and Blackwellgate High Row.

London.—A NEW UNDERGROUND RAILWAY MAP.—A map of the Underground Railway system serving the central area which has just been published by the London Passenger Transport Board has 3-in. circles in place of the customary " dots " indicating the position of the stations. These circles show the streets adjacent to the station and the position in these streets of the station entrances. Separate colours are used for the individual lines and the small station maps are coloured similarly. The map is being exhibited at all " Underground " stations.

Southend-on-Sea.—PROPOSED NEW TROLLEY-BUS ROUTES.—The Transport Committee has approved in principle the proposals of the general manager (Mr. B. England) for the provision of additional trolley-bus routes, but has decided to defer, for one year, the question of applying for the necessary statutory powers to authorise the extensions to be carried out. The general manager has been instructed to communicate with the Westcliff Motor Services, Ltd., and the Borough Services,

Ltd., with respect to the suggested construction of a trolley-bus route from Cuckoo Corner to the junction of Priory Crescent North with Eastern Avenue.

South Shields.—TROLLEY-BUSES.—The Town Council has been informed that there is no likelihood of a grant being obtained from the Special Areas Commissioner towards the introduction of trolley-buses into the town, and it has decided to proceed with the work independently.

Communications

Ceylon.—NEW TELEPHONE SERVICE.—A telephone service between Great Britain and Ceylon was inaugurated last week.

France.—DIRECT LINK WITH THE U.S.A.—Arrangements have been completed for the opening of a direct radio-telephone service between France and the United States before July next. The Paris correspondent of *The Times* states that one of the four two-way circuits at present used for communication between New York and London will be made available for the New York-Paris service, which will be open for traffic daily between 2 p.m. and 10 p.m. During the remaining hours Franco-American traffic will, as before, pass through London. An agreement has been signed between M. Mandel, French Minister of Posts and Telegraphs, and Major Tryon, the British Postmaster-General, for the surrender to France of the greater part of the Franco-American traffic now handled by London. Under this agreement, which is to remain in force for a period of twelve years, France undertakes to compensate the Post Office for the capital cost incurred in building up wireless telephone communication between Europe and the United States, and also undertakes to keep the charges for telephoning between Paris and New York on the same level as those for telephoning between London and New York. All other European traffic will continue to pass through London.

Great Britain.—FURTHER TELEPHONE CONCESSIONS.—In the House of Commons last week Major G. C. Tryon, the Postmaster General, stated that the successive reductions made in the telephone charges since October last year had continued to give satisfactory results. Day calls had increased by 12 per cent. to 365,000 per week, and night calls by 180 per cent., to 180,000. Approximately 200,000 new telephones had been brought into use—nearly twice as many as during the previous twelve months. He proposed to reduce the rental of ordinary extension telephones from 16s. to 14s. a year, and to introduce a lower scale of charges for private branch exchange extensions, also for certain minor facilities. These new rates would come into force on January 1st next. He hoped, next spring, to make the maximum charge for a three minute call to any part of Great Britain 2s. 6d.

TELEVISION.—According to the daily Press the Baird Television Co. hopes to give the first public demonstration of big-screen television at the Dominion Theatre, London. The screen will be 24 ft. wide, and, if permission can be obtained from the Postmaster-General, the broadcast is to be from the Crystal Palace.

Papua.—BROADCASTING.—A *Reuter* message states that the first broadcasting station in the Pacific Islands has been officially opened by Sir Hubert Murray at Port Moresby.

Sweden.—NEW BROADCASTING STATION.—A *Reuter's Trade Service* message from Stockholm says that a new 100 kW broadcasting station is to be erected in Scania, in south Sweden. It will be completed by the end of 1937.

Turkey.—TELEPHONIC COMMUNICATION.—According to the *Journal des Telecommunications*, there are now about 20,000 subscribers to the telephone exchanges in Turkey. Long-distance connections, which are gradually being extended, are now available between Istanbul, Bursa, Yalova, Edirne and Eskisehu. Angora, the capital city, and Istanbul are linked up with all the principal countries in Europe. The Turkish telegraph system is also being extended, and there are now 830 telegraph offices in the country, while the length of the telegraph lines extends to 17,770 miles.

New London Trolley-bus Services

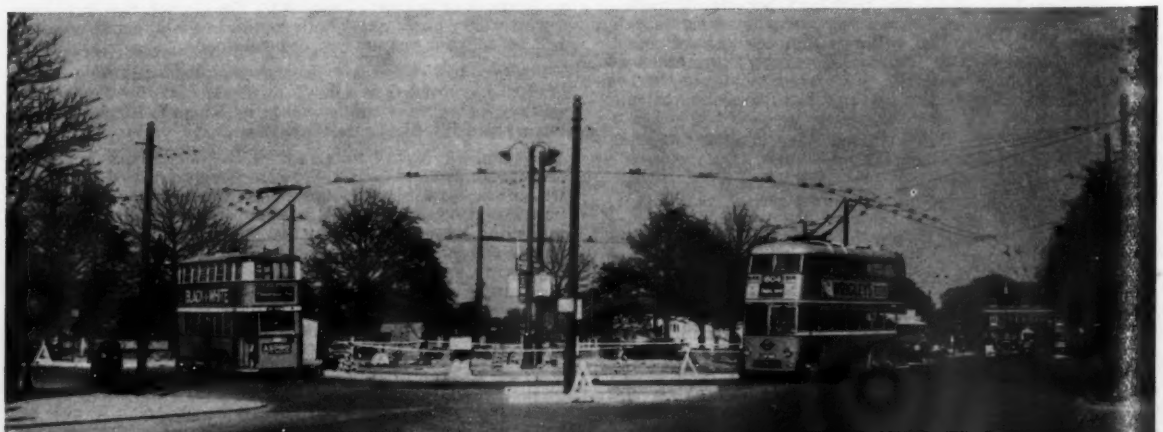
LAST Sunday the first part of the London Passenger Transport Board's scheme for converting a large number of its tram services to trolley-bus working was brought into effect. The routes which have been converted are those from Shepherd's bush *via* Chiswick, Kew and Brentford to Hounslow, and from Hammersmith *via* Chiswick, Kew, Brentford, Twickenham and Hampton Hill to Hampton Court, covering about fifteen miles of route. A fleet of fifty-two of the 70-seater A.E.C. trolley-buses, described on page 454 of our issue of October 4th, will operate these services. For several months past tram drivers have been receiving an intensive course of instruction in driving trolley-buses, at the same time acquiring a technical knowledge of the working of the vehicle.

Demonstrating the working of trolley-bus contactors to tram drivers

The additional power requirements of the large trolley-buses and the frequent services have been met by installing an automatic glass-bulb rectifier sub-station at every two miles along the route. On the average four pairs of 0.4 sq. in. feeders run from each sub-station to give a separate feed to each half mile of overhead line. These feeders are protected by high-speed circuit-breakers on the positive side, coupled with contactors on the negative side. A special indicator has been evolved whereby the insulation resistance of the whole section, including feeders and cars, can be determined while the section is alive and each sub-station is equipped with one of these instruments.

The Hounslow depôt is being completely reconstructed and almost doubled in size; it will now accommodate thirty-five trolley-buses.

A further fifteen miles of trolley-bus route from Woolwich *via* Erith to Bexley Heath and from Woolwich *via* Welling and Bexley Heath to Dartford will be opened during this month, and a service between Sutton, Croydon and Crystal Palace a little later. Other sections to be converted during the spring and summer of next year will include Acton to Edgware; Finchley to Cricklewood; Paddington to Sudbury; and Shepherd's Bush to Uxbridge.



The trolley-bus turning circle at Hampton Court

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—November 14th. Electricity Department. Two 200-kVA transformers. (October 25th.)

Aldershot.—November 5th. Electricity Department. Four 250-kVA transformers. (October 25th.)

Australia.—SYDNEY.—December 9th. Electricity Department. 33,000-V and 11,000-V metal-clad switchgear for the Camperdown sub-station. (T.Y. 10183.)*

Billingham-on-Tees.—U.D.C. Installation of electricity in 135 houses on the Chilton's Lane estate, including all wiring, &c. Clerk, Council offices, Haverton Hill.

Birmingham.—November 5th. Electric Supply Department. Motor convertors. (October 11th.)
November 8th. One 400-kW glass-bulb traction rectifier set for the Lyndon End sub-station (Spec. No. S.E.79). City electrical engineer, 14, Dale End (deposit £2).
November 11th. Two centrifugal oil purifiers for the Hams Hall power station. City electrical engineer, 14, Dale End (deposit £2).

Bolton.—November 8th. Housing Department. Electrical installations in 126 houses, flats, &c., on the Willows Lane estate. Housing director, Westminster Bank Chambers, Old Hall Street North.

Carlisle.—November 15th. Electricity Department. Meters. (See this issue.)

Clitheroe.—November 4th. Electricity Department. Three switchboards. (October 18th.)

Colwyn Bay.—November 23rd. Electricity Department. H.p. and l.p. switchgear. (See this issue.)

Egypt.—CAIRO.—January 4th. Mechanical and Electrical Department, Ministry of Public Works. 150-kW Diesel generating set and accessories for the Government Press. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, S.W.1 (deposit £1 0s. 6d., not returnable).

Epsom and Ewell.—November 18th. Electricity Department. L.p. cables. (See this issue.)

Grimsby.—November 6th Electricity Department. L.p. cables. (October 25th.)

Halifax.—November 11th. Housing Committee. Various works, including electrical, in 202 houses on the Ovenden Hall estate. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £2 2s.).

Harefield.—November 11th. Middlesex County Council. Automatic telephone system, cabling and instruments, &c., for the County Sanatorium. (October 18th.)

Harwich.—November 11th. Electricity Department. E.h.p. and l.p. switchgear, e.h.p. switch kiosk, and transformers. Supply, laying and jointing of 5,500 yards of 6,600-V cable. (October 25th.)

Hastings.—November 4th. Electricity Department. Transformers, poles, galvanised steelwork, &c. (October 18th.)

Holbeach.—November 21st. Holland C.C. Engineering works in connection with Holbeach Institution. (October 18th.)

Hull.—November 7th. Electricity Department. Electrical accessories for assisted wiring scheme. (October 25th.)

India.—November 12th. India Store Department. 100-ton overhead electric travelling crane. Director General, Belvedere Road, Lambeth, S.E.1 (deposit 5s.).

London.—H.M. OFFICE OF WORKS.—November 7th. Illuminated external hanging signs. (October 25th.)
CENTRAL ELECTRICITY BOARD.—December 9th. 66-kV overhead transmission lines for the North-West England and North Wales Electricity Scheme. (See this issue.)

New Zealand.—WELLINGTON.—January 21st. Posts and Telegraph Department. Battery plates, &c. (T.Y. 10175.)*
January 28th, 1936. Public Works Department. 50-kV switchgear and steelwork for Section 425 of the Arapuni scheme. (T.Y. 10154.)*
January 21st. 110-kV switchgear and steelwork for the Paraparaumu sub-station. (T.Y. 10152.)*
February 4th, 1936. Three 750-kVA oil-immersed self-cooled single-phase transformers (T.Y. 10176.)* 11-kV switchgear and metering equipment for the Paraparaumu sub-station of the Mangahao power development scheme. (T.Y. 10177.)*

Northern Ireland.—BELFAST.—November 11th. Electricity Department. Electrically operated addressing machine, condenser tubes, automatic telephone switchboard, ventilating and air filtering plant. (See this issue.)

Portsmouth.—November 18th. Corporation. D.p. switch fuses and cooker control units. (See this issue.)

Solihull.—November 2nd. U.D.C. Vertical-spindle electrically driven centrifugal pumps, including motors, shafting, cast-iron pipes, float gear, switchgear, and electric wiring. R. Dunn, engineer, Council Offices.

Staffordshire.—November 11th. Potteries Water Board. Two sets of electrically-operated rotary pumps; also one Diesel-driven d.c. generating set. P. Wilkinson, engineer, Staffordshire Potteries Water Board, Albion Street, Hanley, Stoke-on-Trent (deposit £5).

Walsall.—November 11th. Electric Supply Department. Material and apparatus for the year ended December 31st, 1936. (October 25th.)

Warrington.—November 6th. Health Committee. X-ray apparatus, with a Scott-connected transformer, for the Hefferston Grange Sanatorium, Weaverham. G. W. N. Joseph, Officer of Health, Health Department.

West Ham.—November 25th. Electricity Department. Paper-insulated cables and coal. (See this issue.)

West Riding.—November 14th. Mental Hospitals Board. Wiring for electric lighting in No. 2 nurses' residence, Menston Mental Hospital, near Leeds. W. E. H. Burton, architect and engineer to the Board. Mental Hospital, Wakefield (deposit £2 2s. to G. L. Banner, clerk of the Board, Victoria Chambers, Wood Street, Wakefield).

Wolverhampton.—November 11th. West Midlands J.E.A. Electrical installation for the extension of Ironbridge generating station. (October 25th.)

Worthing.—November 11th. Electricity Department. Transformers. (See this issue.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Bedfordshire.—Mental Deficiency Committee. Accepted. Electrical services at Mental Colony (£5,145).—Building & Colliery Supply Co., Ltd.
Education Committee. Accepted. Electric lighting at new Stewartby schools (£540).—H. Bacchus, Ltd.

Blackburn.—Accepted. Electrical work at the Market Hall (part of £13,000 reconstruction scheme).—Nelson Engineering Co., Ltd.

Canterbury.—Kent and Canterbury Hospital Board of Management. Accepted. Electrical work at hospital.—B. French, Ltd.

Cardiff.—Electricity Committee. Accepted. Voltage testing equipment (£341).—Ferranti, Ltd.

Glasgow.—Electricity Committee. Accepted. Medium-size electric cookers.—General Electric Co., Ltd.
Lighting Committee. Accepted. 1,000 street-lighting lanterns.—Revo Electric Co., Ltd.

Grimsby.—Electricity Committee. Recommended. E.h.p. switchgear (£2,100).—Metropolitan-Vickers Electrical Co., Ltd. Two l.p. switchboards (£520).—W. Lucy & Co., Ltd. Two 6.6-kV transformers (£724)—Brush Electrical Engineering Co, Ltd. Automatic voltage regulator (£153).—Ferranti, Ltd.

Leeds.—Electricity Committee. Recommended. Turbo-alternator and condensing plant for Kirkstall power station.—British Thomson-Houston Co., Ltd.

London.—BERMONDSEY.—Electricity Committee. Recommended. Two transformers (£72 each).—General Electric Co., Ltd.
BRIXTON.—L.C.C. Accepted. Electric lighting and power installation at Vassall Road school (£604).—Buchanan & Curwen, Ltd.
L.C.C.—Electric wiring and fittings in 383 houses and flats, &c., at Becontree :—
Holliday, Hall & Stinson, Ltd. (Accepted), £4,161.
Rylands Electrical Co., Ltd., £4,395.
Jacob White & Co., Ltd., £4,670.
Archibald Meckhonik, £4,968.
City Electrical Co., £5,463.
G. E. Taylor & Co., £5,490.
Coleby & Co., Ltd., £5,501.
Electrical Installations, Ltd., £5,532.
Buchanan & Curwen, Ltd., £6,187.
Harland & Wolff, Ltd., £6,207.
F. Polden & Co., Ltd., £6,307.
Pinching & Walton, £7,446.
POPLAR.—Contracts Committee. Recommended. P.i. l.c cables for twelve months.—Standard Telephones & Cables, Ltd.

Luton.—Town Council. Accepted. Electrical installations at the new Town Hall (£4,294).—T. Clarke & Co., Ltd.

Middlesex.—Health Committee. Accepted. Electric lighting installation at West Middlesex County Hospital (£346).—G. E. Taylor & Co. This was the lowest of seven tenders, the highest being £450.

Salford.—Light, Heat and Power Committee. Accepted. Supply of three-phase oil-immersed power transformers for twelve months ending September 30th, 1936 (£1,500).—Metropolitan-Vickers Electrical Co., Ltd.

South Shields.—Town Council. Accepted. Lighting sets for the relighting of Ocean Road, King Street and Fowler Street.—General Electric Co., Ltd. (fifteen sets at £13 each); British Thomson-Houston Co., Ltd. (eight sets at £13 each); Revo Electric Co., Ltd. (twenty-three sets at £3 each). Two motors for a new tramcar (£348).—General Electric Co., Ltd. Switchgear for the Quarry Lane sub-station (£506).—A. Reyrolle & Co., Ltd.

Staffordshire.—Mental Hospital Board. Accepted. Electrical services at extensions to Cheddleton Hospital (£2,928).—France's Electric, Ltd.

Tynemouth.—Housing Committee. Recommended. Electrical installations at 428 houses on the Ridges estate (£1,540).—G. Gray.

Wimbledon.—Electricity Committee. Recommended. Switchgear (£5,083).—A. Reyrolle & Co., Ltd.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, November 7th. Institution, London. 6 p.m. "Equipment and Performance of Steel-Tank Rectifier Traction Sub-stations Operating on the London Underground Railways." Mr. A. L. Lunn. (*Meter and Instrument Section*).—Friday, November 1st. Institution, London. 7 p.m. "The Design, Construction and Testing of Voltage Transformers." Mr. J. H. Buchanan. (*North-Eastern Students' Section*).—Friday, November 1st. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. "Cathode Rays—Their Aid To Measurement." Mr. B. C. Robinson. (*Transmission Section*).—Friday, November 1st. Georgian Restaurant, S.W.1. Conversazione, exhibition and dance. (*Mersey and North Wales (Liverpool) Centre*).—Monday, November 4th. The University, Liverpool. 7 p.m. "The Droitwich Broadcasting Station." Sir N. Ashbridge and Messrs. H. Bishop and B. N. McLarty. (*North-Midland Students' Section*).—Tuesday, November 5th. Hotel Metropole, Leeds. 7.15 p.m. Chairman's address. "Payment by Results." Mr. J. W. Ginn. Saturday, November 9th. 3 p.m. Visit to the *Yorkshire Evening News*, Leeds. (*North-Western Centre*).—Tuesday, November 5th. Engineers' Club, Manchester. 7.15 p.m. "The Effect of Legislation and Regulations upon Electricity Distribution." Mr. W. Fennell. (*Wireless Section*).—Wednesday, November 6th. Institution, London. 6 p.m. Chairman's address by Mr. R. A. Watson Watt. (*North-Western Students' Section*).—Saturday, November 9th. Engineers' Club, Manchester. 6.45 p.m. Annual dance.

Faraday House Old Students' Association.—Friday, November 1st. Savoy Hotel, W.C.2. 6.30 for 7 p.m. Annual dinner.

Royal Institution.—Friday, November 1st. Institution, London. 9 p.m. "The Liberation of the Electron." Mr. C. C. Paterson.

Association of Mining Electrical Engineers (*Kent Sub-Branch*).—Saturday, November 2nd. Dover Technical Institute. 6.30 p.m. "Foundations and Fixing Machines Thereon." Mr. W. R. Howard. (*West Wales Branch*).—Saturday, November 2nd. Swansea. "Some Interesting Problems on Boiler Feed Water."

Electrical Power Engineers' Association (*London Technical Group*).—Monday, November 4th. Caxton Hall, S.W.1. 7.15 p.m. "Developments in Furnace Design and Operation." Mr. B. Samuels. (*West Yorkshire Section*).—Friday, November 8th. Victoria Hotel, Leeds. 6.30 for 7 p.m. Annual dinner and dance.

Institution of Civil Engineers.—Tuesday, November 5th. Institution, London. 6 p.m. Presidential address by Mr. J. D. Watson.

Institution of Heating and Ventilating Engineers.—Wednesday, November 6th. London School of Hygiene and Tropical Medicine, W.C.1. 7 p.m. "Electric Thermal Storage." Mr. J. Eden.

Notes

Mr. Therm's Little Joke

At the General Election Sir William Ray, of E.D.A., who has represented Richmond in Parliament for several years, is to be opposed by Mr. L. L. Gassman, a solicitor.

The E.P.E.A. (N.-W. Midlands)

Many well-known electrical men attended the annual dinner and dance of the North-West Midlands Section of the Electrical Power Engineers' Association, at the Victoria Hotel, Wolverhampton, on October 23rd. Those present included Messrs. C. Cooper, president of the E.P.E.A., W. A. Jones, general secretary, D. J. Duffy, chairman of the North-West Midlands Section, T. A. G. Margary, R. M. Gravett, S. T. Allen, and E. Morgan. The loyal toast was submitted by Mr. Duffy, and Mr. Morgan proposed "The Association." Mr. Morgan congratulated the Association upon its technical groups. Technical knowledge was essential, but he advised them to get as much practical information as they could by not staying too long in one position. The industry was growing, and there was a shortage of good men. Theirs was an industry with unique prospects. The toast of "The Ladies" was submitted by Mr. Gravett, and responded to by Mrs. Davidson. Mr. Duffy proposed the health of Mr. Fry, who, he said, worked harder than anybody realised in organising the events year after year. Mr. Fry responded briefly.

The Fotoliptofono System

The first public demonstration in Europe of the Fernando Crudo system of sound reproduction from printed paper records took place in London last week. The method is claimed to enable a daily newspaper to print an actual record of a public speech, a concert, or a play, which its readers could hear the morning after in their own homes. The record is printed in ink in the ordinary way; it has the appearance of a series of parallel lines of irregular width. It is cut out and wrapped round a cylinder, which is rotated before a beam of light that slowly travels along the whole length of the cylinder. The fluctuating light reflected from the paper record, due to the varying widths of the lines printed on it, is directed on to a light-sensitive device. The resulting pulsating electric current is amplified and used to actuate an ordinary loud speaker. The record is made in much the same way as the sound track on a talking film. A microphone picking up the sound causes the intensity of a beam of light to fluctuate while it impinges on light sensitive material wrapped round a rotating cylinder. The "negative" so obtained is used to prepare a printer's block in the ordinary way. Successive sound tracks are printed side by side at about ten strips to the inch, so that about 300 ft. for five minutes' reproduction can be printed on a sheet measuring 17 by 20 in. Further information is obtainable from Mr. G. A. Rubissow, Thames House, Millbank, S.W.1, European representative of the Compania Funadora Fotoliptofono, S.A., of Buenos Aires.

Tyne E.E. Officers' Reunion

The sixteenth annual reunion of past and present officers of the Tyne Electrical Engineers was held at the headquarters, Tynemouth, on Saturday last. Major P. P. Winter, the C.O., presided and the principal guests were Col. A. B. Ogle, O.B.E., and Col. J. N. Cash, C.R.E. The speakers were Lt.-Col. N. H. Firmin, O.B.E., Major Winter, Col. Ogle, Capt. B. H. Leeson and Major O. M. Short, O.B.E.

High-voltage Engineering

A course on "High Voltage Engineering" is being given at the Borough Polytechnic on Friday evenings from 7 p.m. to 9 p.m. by Mr. E. C. Taylor, B.Sc., A.M.I.E.E. The course includes the study of insulating materials, the design of bushings, breakdown of dielectrics in gases, liquids and solids, surge phenomena, high-voltage transformers and surge generators for testing, measurement of surges by klydonograph and cathode-ray oscillograph. The laboratory is well-equipped with high-voltage apparatus (designed by Mr. W. C. S. Phillips, the head of the department), with which demonstrations and experiments will be carried out during the lectures. The first lecture took place on October 4th, but arrangements have been made so that students joining during the next fortnight will not suffer unduly owing to late enrolment.

Electrical Finance

Sir Robert Renwick, Bt., will be the chief guest at the luncheon of the Batti-Wallahs' Society which is to be held at the Hotel Metropole on Thursday, November 21st, at 12.30 p.m. for 12.55 p.m. He will speak on "Some Aspects of Electrical Supply Finance."

Physical Society Exhibition

The annual exhibition of the Physical Society will be held on January 7th, 8th and 9th at the Imperial College of Science and Technology, South Kensington, S.W.7.

A Supervisors' Conference

During the week-end of October 19th the Association of Supervising Electrical Engineers held a national delegate conference at the Loudoun Hotel, London, which was attended by representatives from fourteen districts, members of the Board of Control and other officials. The sessions of the conference were devoted to business organisation matters and an examination of the progress of the scheme of district organisation which was inaugurated some two years ago. As a result the progress of the Association will be speeded up and greater authority is likely to be given to the regional officials. At a luncheon held at the Loudoun Hotel on October 19th Mr. Harold Hobson, the new president, and Mr. J. M. Kennedy, Pres. I.E.E., and immediate past-president of the Association, attended. In the evening there was a dinner and dance and variety entertainment at the Criterion Restaurant, Piccadilly Circus, when about 270 members and friends attended.

Appointments Vacant

Woman demonstrator for Barking Electricity Department.

Canvasser and plumber-jointer for Eccles Electricity Department.

Temporary examiners for the Aeronautical Inspection Directorate, Air Ministry.

Assistant, Grade II, for the Directorate of Technical Development, Air Ministry.

Technical officer in the Admiralty Technical Pool, Slough.

(See our classified advertisements.)

The North Gawber Mine Explosion

At the inquiry held on October 29th into the explosion on September 12th at North Gawber Colliery, Yorks, which caused the death of nineteen men, Mr. J. A. B. Horsley (Electrical Inspector of Mines) gave evidence. He stated that he was quite satisfied that the explosion was not caused by electricity, and that the facts showed that the number of accidents in pits was not increased by its use—rather the contrary. He agreed that not as much care was taken as was necessary, and said he had worked for fifteen years to get better plant and more care in mines. Cables should be protected or removed before firing shots, and ropes with wires sticking out of them should not be allowed in a pit. Messrs. J. W. Land (chief engineer at the colliery) and J. Cowan (junior electrical inspector of mines) agreed that the explosion was not attributable to electricity. The inquiry was adjourned.

Makers' Names Wanted

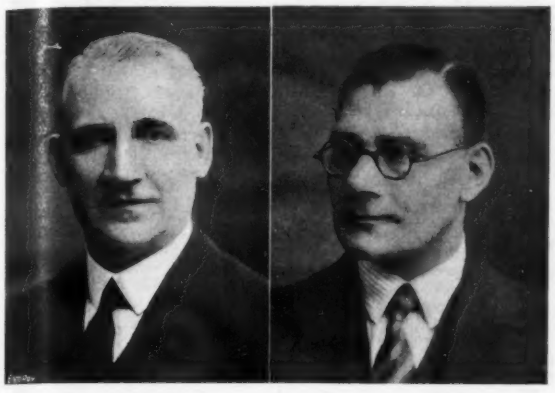
Lamp-locking device for Edison screw lamps.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

At the ordinary meeting of the Institution of Electrical Engineers on November 7th, Lt.-Col. K. Edgcumbe, T.D., past president, will, on behalf of Colonel R. E. Crompton, C.B., F.R.S., present to the Institution an oil painting of Colonel Crompton by Mr. George Harcourt, R.A. The painting was subscribed for and presented to Colonel Crompton by a group of "Old Cromptonians" and others on the occasion of his ninetieth birthday, but at his express desire it is now to become the property of the Institution. A reproduction of the portrait appeared in our issue of June 7th.

It will be remembered that on the death of Mr. A. F. Harris, the managing director of Messrs Nalder Bros. & Thompson, Ltd., at the end of last year, **Mr. A. G. O'Neill** was appointed general manager and **Mr. A. B. Gibbons** assistant general



Mr. A. G. O'Neill **Mr. A. B. Gibbons**

manager and secretary. These gentlemen have now been elected to the board, Mr. O'Neill becoming the managing director and Mr. Gibbons, director and secretary, thus assuring the continuity of the successful management of this old-established company.

Mr. E. J. Beaver, eldest son of the managing director of the Sun Electrical Co., Ltd., and **Mr. R. J. Rawlings,** also the son of a director, have been appointed directors of the company. Mr. E. J. Beaver has been widely known for some years past as manager of the Radio Department, and Mr. Rawlings equally so as manager of the Domestic Appliances and Heating Department of the Sun Company.

Mr. W. G. Verdon Smith, C.B.E. (chairman and managing director), **Colonel S. Smith,** C.B.E. (director and general manager), and **Sir G. Stanley White, Bt.** (director), have retired from the board of the Bristol Tramways & Carriage Co., Ltd., in consequence of the claims of other business. **Mr. J. F. Heaton** (chairman and managing director of Messrs. Thomas Tilling, Ltd.), has been elected to the board and has been appointed chairman. **Mr. A. R. Hoare,** M.Inst.C.E., consulting engineer, of Westminster, has also been elected a director. **Major F. J. Chapple** (general manager of the West Yorkshire Road Car Co., Ltd.) has been appointed general manager.

Mr. T. R. Stretton, B.A. (Camb.), B.Sc. (Eng.) (Lond.), has been appointed technical assistant in the Patent Department of Electric & Musical Industries, Ltd., Hayes, and has already taken up his duties.

Mr. D. W. Morton, electrical engineer at Bentley Colliery for the past seven years, has been appointed assistant chief electrical engineer to the Doncaster Collieries Association, Ltd., controllers of many of the most important pits in the South Yorkshire coalfield.

Mr. Gordon Touche has been elected a director of the Sphere Investment Trust to fill the vacancy caused by the death of Sir George Touche.

Mr. Harold Brown, a governor of the British Broadcasting Corporation, has been appointed vice-chairman, and **Caroline Viscountess Bridgeman** has been made a governor of the Corporation for the remaining term of the present charter.

Mr. A. J. Fippard has been appointed a director of the Shropshire, Worcestershire and Staffordshire Electric Power Co. and the South Wales Electric Power Co.

Mr. A. Cox, who was for some years a representative of the Marshall Electric Co., has now joined the sales staff of Messrs. Young & Wildsmith, Ltd.

Professor L. Bairstow, F.R.S., has been elected Dean by the Faculty of Engineering, London University, for the remainder of the period 1934-36, in succession to Prof. A. H. Jameson, who has resigned.

Mr. F. Barrell, of the General Electric Co., Ltd., has been appointed sub-station superintendent with the Poplar Electricity Department at a salary of £480 per annum.

Mr. W. Reavell, M.I.Mech.E., M.I.N.A., managing director of Messrs. Reavell & Co., Ipswich, has been re-elected president of the British Engineers' Association.

Alderman J. Chuter Ede, chairman of the London & Home Counties Joint Electricity Authority and Labour M.P. for South Shields from 1929-1931, has been adopted as Labour candidate for South Shields in the coming general election.

Mr. J. W. Mayall, of Messrs. Mayall & Co., Ltd., Birmingham and Nottingham, and president of the Electrical Wholesalers Federation, has been returned unopposed to the Sutton Coldfield Town Council.

Under an Order-in-Council dated February 6th, 1928, the Lord President of the Council has appointed Dr. W. H. Mills, F.R.S., Lord Riverdale, K.B.E., Prof. A. Robertson, and Mr. H. B. Shackleton to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. Dr. E. J. Butler, C.M.G., Sir Kenneth Lee, LL.D., and Professor N. V. Sidgwick, C.B.E., have retired from the Council on the completion of their terms of office.

Dr. R. McWhirter has been appointed radiologist to the Royal Infirmary, Edinburgh, in succession to Dr. A. E. Barclay, who resigned recently.

Obituary

Sir John Pybus, Bt.—We have to record the death at the early age of fifty-five years of Sir Percy John Pybus, Bt., M.I.E.E. Sir John, who, we understand, was taken ill at his flat at Whitehall Court last Saturday week, died at a nursing home in London on Wednesday last week. He occupied a prominent position in the electrical industry for some years. When he succeeded Mr. Herbert Morrison as Minister of Transport in 1931 his interest in electricity supply naturally continued, and during his period of office, 1931-1933, he attended in his official capacity the annual luncheon of E.D.A. and various other electrical functions. When he resigned from the Ministry of Transport he resumed his connection with business affairs and became a director of a number of important non-electrical companies. Sir John was the son of Alderman J. Pybus, of Hull. He was born in January, 1880, and in due course adopted electrical engineering as a profession. He served his apprenticeship with a local firm of engineers, and later went as a junior to Messrs. Siemens at Woolwich, becoming subsequently assistant manager of the Siemens works at Stafford. He became an associate member of the I.E.E. in 1910 and a full member in the following year. His closest association with the electrical industry was with the English Electric Co., Ltd., and the companies which were absorbed therein. He was managing director of the English Electric Co. for some years and was also a vice-president of the B.E.A.M.A. He was made a C.B.E. in 1917, and last year became a baronet. He stood unsuccessfully for Shipley as a Liberal in 1923 and 1924, but entered the House of Commons in 1929 as Liberal member for Harwich. It was two years later that Mr. MacDonald invited him to join the National Government as Minister of Transport, and after two busy years, during which the London Passenger Transport Bill was passed, he asked to be relieved of office. He served on a number of committees, including the Advisory Committee of the Department of Overseas Trade, the Balfour Committee on Industry and Trade, and others relating to public utility and salesmanship education. Sir John was unmarried.

[*Vandyk*
The late Sir John Pybus, Bt.

A memorial service was held at St. Bride's, Fleet Street, on Tuesday. Those present included Mr. S. J. Pybus, brother of Sir John, and his two sisters, and a large company of public and business men. The Prime Minister and the Minister of Transport were represented, as were also Lord Hirst (by Mr. T. B. O. Kerr), Lord Iliffe (by Mr. Julian Hoare), Sir John Snell (by Mr. R. D. Grieves), Mr. G. H. Nelson, chairman of the English Electric Co., Ltd., and the directors and staff of that company, (by Mr. G. W. E. Hooper), Mr. W. C. Lusk (by Mr. J. N. Stephens), and the ELECTRICAL REVIEW (by Mr. A. H. Bridge).

Mr. J. Edgar.—After an illness lasting three weeks, Mr. James Edgar, borough electrical engineer at South Shields, died at his home in South Shields on October 26th at the age of fifty-six. He had held the position since 1921, and had been an official of the undertaking for more than thirty years. A native of Edinburgh, he received his early training as a mechanical engineer at the Heriot Watt College in that city, and completed his training in the Edinburgh Corporation electricity works.

[Elliott & Fry
Mr. W. Hibbert, whose death was recorded in our last issue

In 1905 Mr. Edgar was appointed an assistant to Mr. J. H. Cawthra, the then borough electrical engineer of South Shields. At that time the Corporation was engaged in a scheme for laying out tramways, and this was largely supervised by Mr. Edgar. In 1907, when this work had been completed, Mr. Edgar was appointed mains superintendent, and held the post until 1920, when he became chief technical assistant. A year later the position of borough electrical engineer became vacant and he was appointed. Mr. Edgar introduced into South Shields an assisted-wiring scheme, and from that time, under his supervision, the electricity undertaking made great strides. In ten years the number of consumers increased from 5,500 to 25,000. He was one of the first members of the British Electrical Development Association (Northern Counties Area) and had been chairman of the Committee of that area on two occasions. Since 1923 he had acted as representative of the North-East Area on the National Joint Board and National Joint Industrial Council for the Electricity (Supply) Industry. He was also a member of the local branch of the National Association of Local Government Officials.

Mr. M. S. Chambers.—The death occurred on October 23rd of Mr. Marcus Stanley Chambers, electrical engineer, of Tunbridge Wells. He was seventy years of age, and was formerly with Messrs. Preece, Cardew & Rider. He was responsible for electric lighting installations at Gibraltar, Malta, Singapore, and at other foreign stations. He had resided at Tunbridge Wells since his retirement about twelve years ago.

Mr. E. A. Antram.—The sudden death is announced of Mr. Edward Alfred Antram, of St. Michael's, Eastern Road, Haywards Heath, who was an engineer on the staff of the Central Sussex Electricity Co. at Haywards Heath. He was forty-two years of age.

Lord Vaux of Harrowden.—The death occurred on October 25th, at the age of seventy-five years, of Baron Vaux of Harrowden, who was a member of the Council of the British Electrical Federation, Ltd., and a director of the Brush Electrical Engineering Co., Ltd., and several of the associated companies of the British Electric Traction Co., Ltd. He was also a vice-president of the B.E.A.M.A.

Mon. Dubeauclard.—The death is reported from Casablanca, as the result of an accident, of M. Dubeauclard, for many years chief of the Morocco Posts, Telegraphs and Telephones.

Will.—Sir Archibald Gilbey Gold, chairman of Pritchett & Gold and E.P.S. Co., Ltd., left £44,378 (net personalty £41,622).

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Arco Electrical (Armature Repair), Ltd.—Private company. Registered October 21st. Capital, £1,000 in £1 shares (500 5 per cent. cumulative preference and 500 ordinary). Objects: To carry on the business of electrical and mechanical engineers and armature winders, &c. The directors are: A. V. I. Jones and Mrs. F. R. Jones, both of 3, Berthons Gardens, Whipps Cross, E.17. Registered office: 30, Cross Street, Hatton Garden, E.C.1.

Multiplex (Sunderland), Ltd.—Private company. Registered October 21st. Capital, £1,000 in 3,600 7 per cent. preference shares of 5s. and 2,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and/or dealers in electric lamps of all kinds, &c. The subscribers are: E. P. Griffiths, 104, Priory Road, Hornsey, N.8, and A. M. Barron, 54, Clarence Avenue, Ilford. W. J. Woodhouse, Aldwych House, W.C., signs documents as director. Registered office: Paley Street, Sunderland.

Fisher Williams, Ltd.—Private company. Registered October 23rd. Capital, £1,000 in 10s. shares. Objects: To carry on the business of manufacturers of and dealers in electrical goods, lighting equipment, radio accessories, &c. The permanent directors are: H. Fisher, 26, Hilldrop Crescent, N.7, R. D. Henderson-Davy, 65, Fowlers Walk, Ealing, W.5. Registered office: 408, Moorgate Station Chambers, Moorfields, E.C.2.

J. E. Sexton & Co., Ltd.—Private company. Registered October 24th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical appliances, musical and scientific instruments, radio equipment, &c. J. E. Sexton, 57, Gray's Inn Road, W.C.1, is the first director. Registered office: 57, Gray's Inn Road, W.C.1.

Readylock, Ltd.—Private company. Registered October 24th. Capital, £7,500 in 150,000 shares of 1s. each. Objects: To acquire from A. F. W. Richards and H. Bright an invention relating to electrical and mechanical clips and plugs, and to carry on the business of electricians, electrical and mechanical engineers, manufacturers of and dealers in electrical apparatus, cables, wires, batteries, accumulators, motors, wireless telegraph instruments, &c. The first directors are R. C. P. Richards and Harold Bright, addresses not stated. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.2.

Armes Radio & Electrical Co., Ltd.—Private company. Registered October 26th. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on by R. H. Moss at 53, Downs Road, Clapton, E.5, and to carry on the business of electrical, radio and television engineers, &c. The directors are: R. H. Moss and Mrs. E. D. Moss, both of 53, Downs Road, Clapton, E.5. Secretary: Mrs. E. D. Moss. Registered office: 53, Downs Road, Clapton, E.5.

Returns of Electrical Companies

Flinders (Wholesale), Ltd.—Capital £7,250 in 3,000 non-cumulative preference and 4,000 "A" ordinary shares of £1 each and 5,000 "B" ordinary shares of 1s. each. Return dated July 17th, 1935. 3,000 non-cumulative preference, 3,000 "A" ordinary and 3,025 "B" ordinary shares issued and fully paid up in cash. Amount of indebtedness in respect of mortgages and charges, £24,121.

Beethoven Radio, Ltd.—The nominal capital has been increased by the addition of £18,500 beyond the registered capital of £1,500. The additional capital is divided into 8,500 ordinary and 10,000 6 per cent. redeemable cumulative preference shares of £1 each.

Philco Southern Distributors, Ltd.—Debenture dated October 16th, 1935, to secure £5,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd.

Convertors, Ltd.—L. O. Morris, 79, Salisbury House, London Wall, E.C., was appointed receiver and manager on October 18th under powers contained in debentures dated March 27th and May 10th, 1935.

S. P. Catterson & Sons, Ltd. (old company).—H. D. Bell, 53, New Broad Street, E.C., ceased to act as receiver and manager on October 18th, 1935.

Nigerian Electricity Supply Corporation, Ltd.—Capital, £500,000 in 450,000 preferred ordinary shares of £1 and 200,000 ordinary shares of 5s. Return dated July 25th, 1935. All shares taken up. £450,076 15s. paid on 450,000 preferred ordinary and 307 ordinary shares. £49,923 5s. considered as paid on 199,693 ordinary shares. Mortgages and charges, £213,400.

Langs (Wimbledon), Ltd.—Two notices of the appointment of C. A. Sandon, 1a, Sloane Court, Chelsea, S.W., as receiver on October 21st, 1935, under powers contained in debentures dated November 9th, 1928, and January 25th, 1932.

Mersey Mouldings, Ltd.—Debenture dated October 15th, 1935, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. O. Hughes, 30, Briar Drive, Huyton, Lancs.

North Lincolnshire and Howdenshire Electricity Co., Ltd.—The nominal capital has been increased by the addition of £150,000 in £1 shares beyond the registered capital of £100,000. At April 30th, 1935, the Yorkshire Electric Power Co., held 99,000 out of 99,007 shares issued.

I. M. K. Syndicate, Ltd.—The nominal capital has been increased by the addition of £375 beyond the registered capital of £337 10s. The additional capital is divided into 750 shares of 10s. each.

Young Accumulator Co. (1929), Ltd.—Capital, £225,000 in 2s. shares. Return dated June 26th, 1935. 852,500 shares issued and fully paid up. Mortgages and charges: £25,000. A return of allotments, made up to August 29th, 1935, shows a further 57,292 shares allotted for cash and fully called up.

East Devon Electricity Co., Ltd.—Capital, £350,000 in £1 shares. Return dated June 12th, 1935. All shares taken up. £315,000 paid, £35,000 considered as paid. Mortgages and charges, nil.

Hanovia, Ltd.—Capital, £25,000 in £1 shares. Return dated June 12th, 1935. All shares taken up. £20,500 paid, £4,500 considered as paid. Mortgages and charges, nil.

Cables & Wireless (Holding), Ltd.—Capital, £53,700,000 in £23,500,000 5½ per cent. cumulative preference stock, £21,200,000 7½ per cent. "A" ordinary stock, and £9,000,000 "B" ordinary stock. Return dated June 7th, 1935. £23,219,618 preference, £20,767,077 "A" ordinary, and £8,702,782 "B" ordinary stock taken up. £7 paid, £52,689,470 considered as paid. Mortgages and charges, nil.

Edison Storage Battery Distributors, Ltd.—Capital, £12,000 in £1 shares. Return dated June 12th, 1935. 5,000 shares taken up. £5,000 paid. Mortgages and charges, nil.

Tisbury Electric Supply Co., Ltd.—Capital, £6,000 in £1 shares. Return dated June 6th, 1935. All shares taken up. £6,000 paid. Mortgages and charges, nil.

Northleach Electric Supply Co., Ltd.—Capital, £3,000 in £1 shares. Return dated June 11th, 1935. 2,195 shares taken up. £2,245 paid (including £50 paid on forfeited shares).

David Rowan (Vidro), Ltd.—Capital, £5,000 in 1,750 10 per cent. preference and 3,250 ordinary shares of £1. Return dated June 4th, 1935. 1,186 preference and 2,901 ordinary shares taken up. £1,587 paid, £2,500 considered as paid. Mortgages and charges, nil.

Brasse, Ltd.—E. Stone, incorporated accountant, of Devonshire House, 4, The Broadway, Crouch End, N.8, was appointed receiver and manager on September 18th, 1935, under powers contained in debenture dated February 12th, 1931.

Clang, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated September 17th, 1935, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

George Ellis, Ltd.—Capital, £2,000 in £1 shares. Return dated April 1st, 1935. 1,152 shares taken up. £2 paid, £1,150 considered as paid. Mortgages and charges, nil.

Harry Astbury, Ltd.—Capital, £1,000 in £1 shares. Return dated April 12th, 1935. 366 shares taken up. £366 paid. Mortgages and charges, nil.

Painter Brothers, Ltd.—Capital, £40,000 in 30,000 ordinary shares of £1 and 8,000 ordinary and 12,000 preference shares of 10s. Return dated April 9th, 1935. 30,000 £1 ordinary and 12,000 preference shares taken up. £36,000 paid. Mortgages and charges: £29,800.

J. Smith & Son (Brighton), Ltd.—Capital, £12,000 in 4,500 preference and 7,500 ordinary shares of £1. Return dated April 19th, 1935. 4,500 preference and 4,303 ordinary shares taken up. £4,503 paid on 4,500 preference and three ordinary shares, £4,300 considered as paid on 4,300 ordinary shares. Mortgages and charges: £7,500.

Bath Electric Tramways, Ltd.—Capital, £230,000 in 75,000 preference, 125,000 preferred ordinary and 30,000 deferred ordinary shares of £1. Return dated April 9th, 1935. 75,000 preference, 75,606 preferred and 30,000 deferred ordinary shares taken up. £150,606 paid, £30,000 considered as paid. Mortgages and charges: £102,761.

Roberts (South Shields), Ltd.—Debenture, dated August 31st, 1935, to secure sums which the chargee may be called upon to pay under a guarantee to Lloyds Bank Ltd., not exceeding £3,000, inclusive of £1,500 already registered. Holder: T. B. Carr, "Rosarium," Sunderland Road, Westoe, South Shields.

Baker & Hyman, Ltd.—Capital, £2,000 in £1 shares. Return dated March 1st, 1935. All shares taken up. £15 paid, £1,985 considered as paid. Mortgages and charges, nil.

Allbright Electric Co., Ltd.—Capital, £5,000 in £1 shares. Return dated March 11th, 1935. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Tilley Bros., Ltd.—Satisfaction to the extent of £3,500 on July 8th, 1935, of charge dated July 31st, 1931, and registered December 4th, 1931. (Notice filed October 3rd, 1935.)

Floodlighting & Fittings, Ltd.—Particulars filed of £1,000 debentures authorised September 27th, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

City Notes

Baird Television, Ltd.—In a circular letter to shareholders the directors state that while they are of opinion that the proposed capital reorganisation recently announced was fair and equitable to each class of shareholders, they realise the difficulty of establishing a basis which would appeal to each of those classes. As a result of discussions with several important shareholders and representatives of the Shareholders' Protection Association, a scheme has been evolved which has received the unanimous approval of all those consulted. A certain amount of delay must ensue before the new scheme can be submitted to the shareholders, and the meetings which were to have been held yesterday (Thursday) did not take place.

The company informs us that it has satisfactorily concluded negotiations with the Australian Radio Manufacturers' Patents Association, Ltd., of Sydney, N.S.W., whereby that Association has been appointed the exclusive representatives in Australia of the Baird company, both for the construction and operation of television transmitting stations and the manufacture of television receivers under the Baird patents. It is proposed to erect experimental transmitters in Sydney and Melbourne in the near future with a view to the ultimate provision of a commercial high-definition television service.

The Tata Hydro-Electric Group.—The question of the amalgamation of the three Tata hydro-electric power companies was raised at the ordinary general meeting of one of these concerns held in Bombay recently, and in reply a statement on the subject was made by the chairman, Sir Nawroji Saklatwala, who said that a combination of the share capital could and might be effected six years hence, but not at present. Amalgamation could be carried out only at excessive cost.

John Shaw & Sons, Wolverhampton, Ltd., report a net loss for the year to June 30th last of £44 as compared with a net loss in the preceding year of £369. In 1933-34 a dividend of £3,000 was received from the Indian subsidiary, but no dividend was paid in the year under review. The deficiency account has been increased from £220,559 to £237,736, and the cash position is £28,582 (against £593). It is considered that the assets as now shown in the balance-sheet, are definitely good. Proposals are to be made at an early date for the reduction of capital.

The Hastings and District Electric Tramways Co. has entered into a provisional agreement to sell to the Maidstone and District Motor Services its holding of the whole of the share capital of the Hastings Tramways Co. According to the *Daily Telegraph* the sale is to be subject to the approval both of the shareholders and of the income stockholders of the Hastings and District Electric Tramways Co. The purchase consideration will consist of £85,000 in cash and 16,620 fully-paid ordinary shares of the Maidstone and District Motor Services. The latter company will also repay £93,000 owing by the Tramways Co. on loan account.

The British Sangamo Co., Ltd.—Particulars of this company have been published this week, in compliance with Stock Exchange regulations. The company, which was converted from a private company in September, has an issued capital of £150,000 in 10s. ordinary shares, no mortgages or debentures being outstanding. Its principal object is to manufacture electricity meters, time switches and other electrical appliances. It has an arrangement with the Sangamo Electric Co., of Springfield, Illinois, U.S.A., and the Sangamo Co. of Toronto, Canada, for the interchange of all patents and improvements. The balance sheet at December 31st last showed current assets of £110,100 and fixed assets of £90,300. Current liabilities were £38,000. The profit and loss account for 1934 shows a profit, before deducting income tax, of £37,454.

The Perak River Hydro-Electric Power Co., Ltd., announces a net operating revenue for the year to July 31st last of £182,542 (against £116,454). After deducting debenture interest and sinking fund, reserves for expenses of the scheme of arrangement and for duty on increased capital there remains a balance of £51,947, which it is proposed to carry forward. The plant has operated satisfactorily and has been well maintained, but a larger supply was provided by the steam plant than during the previous year. Extensions to the distribution system made necessary owing to the increase of demand were undertaken during the year and are now approaching completion.

Erinoid, Ltd.—Presiding at the annual meeting on October 23rd Mr. A. Binnie (chairman) said that although there had been a decrease in profits for the past year, due to a fall in sales during the first seven months, the last five months had shown a considerable improvement, and the sales had started well in the current year. Export trade had been difficult, and the cost of raw material still remained high. Further improvements in machinery had been made, however, which would reduce the cost of production, and the outlook for the future year was very hopeful.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the register at the expiration of three months, unless cause is shown to the contrary: British Electric Utilities Investment Trust, Ltd.; the Finsbury Radio Co., Ltd.; Radio Listeners, Ltd.; "Raiflecta" Illuminating & Flood-Lighting Co., Ltd.; Westford Radio, Ltd.

The Singapore Traction Co.—It is announced that the agreements under which the Shanghai Electric Construction Co. has managed the business of the Singapore Traction Co. were terminated on October 17th on payment to the Shanghai Co. of £100,000.

The Bengal Telephone Corporation, Ltd., announces a net profit of Rs.10,42,638 for the year to June 30th last, after the transfer of Rs.9,61,276 to depreciation, against Rs.8,71,362 for the preceding year. The ordinary dividend is to be maintained at 8 per cent., leaving Rs.3,28,984 to be carried forward.

Ward & Goldstone, Ltd., have declared an interim dividend on the ordinary shares at the rate of 10 per cent. per annum, less tax.

The City of Buenos Ayres Tramways Co. (1904), Ltd., has announced the usual quarterly dividend of 1¼ per cent.

Meters, Ltd., is maintaining its interim ordinary dividend at 2½ per cent.

Glenfield & Kennedy, Ltd., are paying an interim ordinary dividend of 4 per cent. (against 3 per cent.).

Stocks and Shares

TUESDAY EVENING.

THE outlook for Stock Exchange markets is considered to be sufficiently assured to warrant a good deal of money coming into the House, investment and speculation alike showing more activity than they have done recently. Business is, to drop into colloquialism, not too bad. Expectation looks for a termination before Christmas of the war between Italy and Abyssinia. The issue of the General Election is held to be in so little doubt that investment has no hesitation in putting money into British Government securities and, also, into the popular industrial shares. The rubber market has taken on a new lease of life. The iron and steel market continues to attract attention. There is a good deal of interest being taken in aviation shares. The shares of electrical equipment companies are in active request on the impression that there are very few branches of trade throughout the country which do not contribute, directly or indirectly, their quota of orders to the companies concerned with electrical and cable work. The forthcoming reduction in the telephone rates is deemed likely to provide a good deal of additional employment both for capital and labour.

Gilt-edged Stocks

Evidence of investment confidence is seen in a gain of 2 points that has lifted London Electric Transport 2½ per cent. guaranteed stock to 96. The net yield at this price is 2 per cent. on the money, taking tax at 4s. 6d. in the £, and making no allowance for redemption of the stock. The Board

brought a large number of trolley-buses into operation last Sunday, on certain of its tram routes. Central Electricity stocks keep good: the 5 per cent. 1950-70 issue is 1 up, coming into line with the price of West Midlands Joint Electricity 5 per cents., which are dated two years earlier than the former issue.

Electricity Supply Shares

The market for the ordinary shares in the home electricity supply companies may be said to have fully recovered its resiliency and once more the changes which have occurred are all in the upward direction. These improvements are spread over each of the three groups, London, Provincial and Scottish. Clyde Valley shares are 1s. better at 42s. 6d.; Scottish Power 6d. up at 40s. 6d., Northamptons hardened to 51s. 3d. Smaller gains occurred in Edmundson's, Bournemouth and Poole, and Llanellys, though the nominal prices are left unchanged. Lancashires strengthened to 37s. 6d. The new shares at 7s. 3d. premium are 1s. 6d. up. There is not much doing in the overseas and foreign shares. Palestine "A" ordinary at 47s. 6d. are 6d. better. Tokyo sixes at 87 have gained a point. Atlas came into demand at the advanced price of 6s. Victoria Falls are 3s. 9d. higher at 68s. 9d.

Manufacturing and Equipment

Electric Construction shares at 26s. 9d. show a gain of 2s. 3d. General Electrics are $\frac{1}{8}$ better at 63s. 9d. British Insulated also record a rise. The market for equipment and manufacturing issues is good as a whole. Stock Exchange brokers find a noticeable increase in the inquiry for leading shares in this group. So steady is the investment demand that the supply of shares is rapidly decreasing. It is by no means easy to get the offer of anything like a useful line of shares in this department. Ever Ready shares have benefited by the announcement, given in last week's ELECTRICAL REVIEW, of the usual interim dividend on the ordinary shares of 10 per cent. actual. Doubts had been entertained as to whether the company would be able to maintain this rate. The directors, in their dividend statement, add that sales for the period from April 1st last have been more than maintained. A fair amount of activity is apparent in the market for Telephone Manufacturing and Telephone Rentals shares. The former improved to 7s. 7½d. and Telephone Rentals to 8s. 9d. In the latter company there are new shares, the value of which is, for practical purposes, the same as that of the old, but in the market the price is about 1½d. less. The prospective buyer of shares in the company will find that he can get the new shares a shade cheaper than the old.

Crompton's

One of the principal features in the Stock Exchange Industrial markets this week has been a violent rise in the price of Crompton Parkinson ordinary shares. A week ago they stood at 70s. Now the price is about 13s. 6d. higher. Curiosity is agog to learn what may be the reason for this remarkable jump, and all sorts of rumours are afloat to account for it. It is said that the directors met last Friday to discuss the question of what bonus shall be issued to the shareholders, and this is expected, as may be inferred from the price and the previous experience of the company's policy, to take the shape of ordinary shares. On the 12½ per cent. dividend which the company is paying, the present price is, of course, absurd, but no one pays any attention to the money distribution. Attention is focused, as already observed, upon the probable share bonus, details of which are looked for in the near future. The price of the shares this year has been down to 32s. It touched 86s. on the Tuesday in this week. The nominal value of the shares is 5s. each.

Television

The volatile Electric and Musical Industries shares spurted to 26s. 6d., but reverted to 25s. The three classes of Baird Television shares recovered upon a new scheme being submitted for consideration of the company's proprietors, in the place of that which aroused so much protest. The march of television is drawing purchasers to the shares of companies that are doing installation work in connection with the system, a practical and general exposition of which is expected before the end of this year.

Cable and Wireless

While the price of Cable and Wireless 5½ per cent. preference has strengthened to 102, the A ordinary stock at 25 is a point lower, the anomaly of the movements being due to the more speculative position held by the A stock. On each spurt in the price of the A, a good deal of stock seems to be forthcoming, and it is assumed that part, at any rate, of these sales must be on behalf of people who bought it lower down, and are content to take a profit. The effect of the improving traffic conditions, as reflected by the latest index number, is seen more clearly in the buying of preference stock. Very nebulous rumours persist in regard to the outlook for Cable and Wireless stocks, but at present they are too vague to warrant their repetition here. Globe Telegraph and Trust ordinary, upon constant investment pressure, improved to 13¾, at which they show a rise of 10s. Marconi Marines are $\frac{1}{8}$ up at 32s. 6d., optimism looking for the dividend to be increased to 10 per cent.; last year's distribution was 7½ per cent.

Share List of Electrical Companies

	Nom.	Dividend 1933.	Dividend 1934.	Price Oct. 29.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	3½	—	3 17 5
City of London	1	7½	7½	37/–	—	4 1 0
Clyde Valley	1	7	8	42/6	+1/0	3 15 2
County of London	1	10½	10½	54/6	—	3 17 1
Edmundson's 7% Pref.	1	7	7	35/–	—	4 0 0
Do. Ord.	1	7	8	40/6	—	3 19 0
Elec. Dis. Yorkshire	1	9	9	46/–	—	3 17 9
Elec. Fin. and Securities	1	12½	12½	3⅝	—	3 14 2
Elec. Supply Corporation ...	1	11	11	3⅛	—	3 11 10
Lancs Light and Power	1	7½	7½	37/6	+6d.	4 0 0
Lond. Assoc. Electric	1	—	—	34/–	—	4 2 4
London Electric	1	7	8	38/6	—	4 3 0
London Power deb. Red.... ...	Stock	5	5	108½	—	4 12 4
Metropolitan	1	10	10	51/6	+6d.	3 17 8
Midland Counties	1	7	7	36/6	+6d.	3 16 9
Mid. Elec. Power	1	8	8	41/3	—	3 17 6
North Eastern Electric Ordinary	1	6	6	32/6	—	3 13 10
Do. 7% Pref. ...	1	7	7	34/–	—	4 2 2
Northampton	1	10	10	51/3	+⅛	3 18 0
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary ...	1	10	10	57/6	—	3 9 5
Do. do. 6% Pref.	1	6	6	31/–	—	3 17 5
Scottish Power	1	8	8	40/6	+6d.	3 19 0
South London	1	7	7	33/6	—	4 3 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/–	—	6 16 4
Yorkshire Elec.	1	8	8	42/6	—	3 15 5
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	115	+1	4 7 0
Do. 1955–75 ...	„	5	5	117	—	4 5 6
Do. 1951–73 ...	„	4½	4½	110	—	4 1 10
Do. 1963–93 ...	„	—	3½	101½	+½	3 9 0
London Elec. Trans. Gtd. ...	„	—	2½	96	+2	2 12 2
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A...	„	—	4½	120½	—	3 14 8
Do. do. B...	„	—	5	125½	—	3 19 8
Do. do. C...	„	3½	4	99	—	4 0 10
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	147½	+2	6 2 0
Anglo-Am. Tel. Pref.	Stock	6	6	115½	+½	5 4 0
Do. Def.	„	1½	1½	28	—	5 7 2
Cable & Wireless 5½% Pref. ...	„	2¾	4½	102	+1	4 1 0
Do. A. 7½% Ord.	„	Nil	Nil	25	–1	—
Do. B. Ord.	„	Nil	Nil	7½	—	—
Globe Tel. & Tel. Ord.	10	2½	3½*	13½	+½	2 10 4
Do. do. Pref.	10	6	6	13½	—	4 9 0
Great Northern Tel.	10	20	20	39	—	5 2 7
Marconi-Marine	1	10	7½	32/6	+⅛	4 12 4
Oriental Telephone Ord.	1	12	12	3⅛	—	*3 18 4
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	9d.	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1125	+30	—
Do. do. Pref. Ord.	„	8	8	165	—	4 17 0
Brazil Traction	100	—	—	7¾	—	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	97½	—	5 2 6
Mexican Light Common	100	Nil	Nil	2¼	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	$500	5	5	35	—	—
Victoria Falls Ord.	1	20	20	3⅞	+⅛	—
West Riding	1	5	6½	42/–	+⅛	3 2 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	60/–	—	5 0 0
Assoc. Elec. Ord.	1	4	6	35/–	+6d.	3 8 7
Do. Pref.	1	8	8	37/–	—	4 6 4
Babcock & Wilcox	1	6	8	40/6	—	3 4 9
British Aluminium Ord.	1	5	7½	43/–	+6d.	3 9 7
British Insulated Ord.	1	5	15	4½	+½	3 6 8
Brush Ord.	Stock	Nil	Nil	41½	—	—
Callender's	1	15	15	3¾	+⅛	4 0 0
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/–	—	12½	4⅛	+⅛	0 12 6
Do. 8% Pref.	1	8	8	36/3	—⅛	4 8 4
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	26/9	+2/3d.	2 12 4
Enfield Cable Ord.	1	25	25	4¾	—	5 2 6
English Electric	1	Nil	Nil	16/9	+6d.	—
Do. do. Pref.	1	Nil	Nil	22/6	—	—
Ericssons Tel.	5/–	—	24	30/6xd	—	—
Ever Ready	5/–	35	35	23/3	+1/–	7 10 4
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	10	3⅛	+⅛	3 2 9
Henley's	1	30	30	6¾	—	4 7 3
Do. 4½% Pref.	5	4½	4½	5¼	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	45/6	+1/–	3 6 0
Siemens Ord.	1	6½	4	22/6	—	3 11 1
Telegraph Construction	£1	Nil	Nil	23/9	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

3439. "Multiple thermionic valves." Radioakt.-Ges. D. S. Loewe. February 6th, 1933. (435927.)

6610. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 3rd, 1933. (436078.)

6646. "Oil-filled electric cable installations." Felten & Guilleaume Carlswerk Akt.-Ges. March 1st, 1933. (435860.)

6795. "Public address systems and like sound-amplifying arrangements." H. J. Round. March 2nd, 1934. (435930.)

6848. "Alternating-current electric motors and control systems therefor." W. B. Bennitt, K. W. D. Roberts and Associated Electrical Industries, Ltd. March 3rd, 1934. (436080.)

6897. "Method of transmitting television images by wireless." Radioakt.-Ges. D. S. Loewe. March 6th, 1933. (436142.)

7147. "Synchronous electric motors." Ferranti, Ltd., and W. Holmes. March 6th, 1934 (Cognate application 27073/34). (436145.)

8883. "Operation of electric luminous gas-filled and/or vapour-filled tubes and/or lamps." J. Fodor and V. B. North. March 21st, 1934. (435931.)

9418. "Electric supply systems." British Thomson-Houston Co., Ltd. March 25th, 1933. (436148.)

9615. "Electron-discharge devices and circuits therefor." C. S. Bull and C. S. Agate. March 27th, 1934 (Cognate application 9616/34). (435933.)

9701. "Electrically driven vacuum cleaners." Electrolux, Ltd. April 4th, 1933. (Addition to 350435.) (436149.)

10078. "Electrical signalling systems." Automatic Electric Co., Ltd., and P. N. Roseby. April 3rd, 1934. (436006.)

10232. "Electric driving motors for sound-film apparatus." Telefunken Ges. für Drahtlose Telegraphie. April 4th, 1933. (436094.)

10418. "Means for delivering an intermittent electrical current." H. Hughes & Son, Ltd., and D. O. Sproule. April 6th, 1934. (436159.)

10436. "Receiving arrangements for television, picture transmission, or the like." C. Lorenz Akt.-Ges. April 7th, 1933 (Cognate applications 10437/34, 10438/34 and 10439/34). (436160.)

10487. "Electrical measuring and control systems." H. F. Parker. April 21st, 1933. (436098.)

10495. "Electric heaters for rooms." H. H. Berry and C. A. Painton. April 6th, 1934. (435939.)

10630. "Thermally released automatic electric circuit-breakers." G. Ellison, Ltd., and J. Anderson. April 9th, 1934. (436010.)

11601. "High-frequency transmission systems." E. L. C. White and E. C. Cork. April 17th, 1934. (436012.)

12506. "Amplifying valves such as for use in radio receivers." E. Y. Robinson and Associated Electrical Industries, Ltd. April 25th, 1934. (436166.)

12614. "Electric lighting fittings." General Electric Co., Ltd., and S. W. Richards. April 26th, 1934. (436167.)

13030. "Thermionic amplifiers." Ferranti, Ltd., A. Hall and M. K. Taylor. April 30th, 1934. (435878.)

13561. "Electric regulators." British Thomson-Houston Co., Ltd. May 6th, 1933. (436168.)

14923. "Electrically conductive harpoon lines and harpoons therefor." Siemens-Schuckertwerke Akt.-Ges. May 18th, 1933 (Cognate application 14929/34). (436102.)

15196. "Control of electric motors." N. Pensabene. May 22nd, 1934. (436170.)

15722. "Electrical switches of the enclosed type." F. R. Pendergast, S. E. Sheerman and the United Electrical Co. (Coolex), Ltd. May 26th, 1934. (436172.)

16311. "Manufacture of photo-electric cells." General Electric Co., Ltd., and C. H. Simms. May 31st, 1934. (436023.)

16409. "Electrostatic condensers." C. Dannatt and Associated Electrical Industries, Ltd. June 1st, 1934. (435881.)

16419. "Pins for thermionic valves or the like devices." General Electric Co., Ltd., and R. J. Kaula. June 1st, 1934. (436173.)

18235. "Contact fingers for electric circuit controllers." J. G. Smithson and J. G. Smithson & Co., Ltd. June 20th, 1934. (435882.)

18379. "High-frequency coils." Siemens & Halske Akt.-Ges. June 26th, 1933. (435884.)

18910. "Automatic electric-welding machines." A. J. Thorndoe. June 27th, 1934. (436106.)

21506. "Switching arrangements for controlling the duration of operation of electrical apparatus." British Thomson-Houston Co., Ltd. July 22nd, 1933. (435949.)

21555. "Fusible electric cut-outs." Callender's Cable & Construction Co., Ltd., and A. W. Metcalf. July 23rd, 1934. (436175.)

21564. "Safety device for electrical heating appliances." P. McIlveney. July 23rd, 1934. (435887.)

21593. "Apparatus for the agitation of the electrolyte in electrolytic cells." J. G. Walling. July 24th, 1934. (436176.)

21690. "Electrometers." A. Gemant. July 24th, 1934. (435950.)

22289. "Television, telekinematographic and like systems." A. G. D. West and Baird Television, Ltd. July 31st, 1934. (436108.)

22316. "Electric signalling systems." T. H. Flowers. July 31st, 1934 (Addition to 401033). (436177.)

24385. "Starting-handles or electrical starter-motors of internal-combustion engines." F. Barbagli. August 24th, 1934. (435952.)

25015. "Electric motors." British Thomson-Houston Co., Ltd. August 31st, 1933. (436035.)

27057. "Thermionic cathodes." M-O Valve Co., Ltd., C. J. Smithells, and G. W. Warren. September 20th, 1934. (435957.)

29983. "Operating mechanism for electric circuit-breakers." British Thomson-Houston Co., Ltd. October 19th, 1933. (436040.)

30419. "Electric cables and conductors." G. Fodor. October 28th, 1933. (435960.)

30629. "Liquid-break electric switches." British Thomson-Houston Co., Ltd. October 26th, 1933. (435961.)

30928. "Cooling systems for dynamo-electric machines." Electric Auto-Lite Co. November 20th, 1933. (435892.)

31654. "Electro-deposition of metals." Harshaw Chemical Co. March 14th, 1934. (Cognate application 31655/34.) (436042.)

33404. "Metal-vapour current-rectifiers." Siemens-Schuckertwerke Akt.-Ges. December 9th, 1933. (435963.)

33737. "Electric condensers." Dubilier Condenser Co. (1925) Ltd. June 4th, 1934. (435964.)

35813. "Flash-light lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 15th, 1933. (436047.)

36465. "Metal-vapour current rectifiers." J. T. Shevlin (Siemens-Schuckertwerke Akt.-Ges.). December 19th, 1934. (436048.)

37385. "Electric resistances." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 3rd, 1934. (435901.)

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255. "Attachment of metal filaments to the leading-in wires of electric lamps and the like." British Thomson-Houston Co., Ltd. January 3rd, 1934. (435970.)

2235. "Radio direction-finding receivers." Telefunken Ges. für Drahtlose Telegraphie. January 23rd, 1934. (436186.)

3073. "Electric condenser and oscillation circuit arrangements." Porzellanfabrik Kahla. February 1st, 1934. (436056.)

3096. "Electric indicating or recording apparatus for automatic weighing machines." S. Toth. March 28th, 1933 (divided out of 9694/34). (436119.)

3340. "Portable electric-battery lamps." R. Dight. February 1st, 1935. (435908.)

3814. "Electrically operated alarm devices." D. B. McLaren. February 6th, 1935. (435973.)

4970. "Telegraph receivers." Soc. Francaise Radio-Electrique, February 15th, 1934. (436188.)

5237. "Electrical circuit-interrupters." Westinghouse Electric & Manufacturing Co. March 16th, 1934. (436122.)

6282. "Electric variable resistances." L. Salamon and G. Stern. March 1st, 1934. (435914.)

8352. "Electric discharge devices." Standard Telephones & Cables, Ltd. October 3rd, 1934. (436060.)

9027. "Cathode-ray tubes." Telefunken Ges. für Drahtlose Telegraphie. March 22nd, 1934. (436189.)

9812. "Sparking plug provided with an ionising member." C. Michel. September 29th, 1934. (436062.)

11848. "Stereophonic reproduction of sound." Electrical Research Products, Inc. April 26th, 1934. (435980.)

13134. "Electrical condensers." P. S. Sporing and the Telegraph Condenser Co., Ltd. May 2nd, 1935. (436128.)

13135. "Electrical condensers.' P. A. Sporing and the Telegraph Condenser Co., Ltd. May 2nd, 1935. (436129.)

13138. "Electrical condensers." F. C. Stephan, P. A. Sporing and the Telegraph Condenser Co., Ltd. May 2nd, 1935. (436130.)

13241. "Electric motor drives for centrifugal machines." British Thomson-Houston Co., Ltd. May 3rd, 1934. (435982.)

13405. "Electrically heatable spectacle lenses, and method of making same." C. Zeiss. May 7th, 1934. (436132.)

14504. "Starting systems for electric motors or other electric apparatus." British Thomson-Houston Co., Ltd. May 18th, 1934. (436136.)

14795. "Electrical condensers." F. C. Stephan, F. L. G. Bettridge and the Telegraph Condenser Co., Ltd. May 21st, 1935. (436195.)

16287. "Electrically operated tools." R. Bosch Akt.-Ges. June 9th, 1934. (435923.)

19195. "Magnetic separators." H. H. Thompson and A. E. Davies. January 26th, 1934 (divided out of 2742/34). (436138.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 23rd:—

Duchess. No. 562960. Class 6. Vacuum cleaners.—L. A. Budd, 99, St. George's Road, S.W.1.

Pyramid. No. 554630 (lettering and design). No. 554631 (lettering only). Class 13. Flat irons, waffle irons, curling irons, footwarmers, kettles, saucepans, coffee percolators, &c., all being electrically heated, and electric plug-and-socket connections.—Hague and McKenzie, Ltd., Pyramid Works, Sloane Street, Parade, Birmingham.

Resitex. No. 557283. Class 50. Moulded articles, electrical insulating materials, and insulating parts of electrical apparatus, all being wholly or principally made of synthetic resin and fibrous materials.—Robert Bosch Gesellschaft, Stuttgart, Germany. (British representatives: W. P. Thompson & Co., 12, Church Street, Liverpool.

Cooking and Water Heating in Germany

In a recent issue of *Elektrotechnische Zeitschrift* some figures taken from a report drawn up by the Economic Group of the Association of Electricity Supply Undertakings on progress in the use of electrical domestic appliances in Germany are published. The report shows that the number of household electric cookers in use in the country at the end of 1934 amounted to 232,030 as compared with only 153,236 at the close of the previous year, an increase of 51.4 per cent. During the same period the number of large electric baking and confectionery-making installations increased from 590 to 815, and those of domestic electric water heaters from 60,364 to 85,476, the latter representing an increase of 41.6 per cent.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Houses (150); U.D.C. surveyor.

Aberdeen.—Houses (48), Tanfield site; A. B. Gardner, city architect, 11, Broad Street.

Ampthill.—Church, Flitwick Road; Pullen & Ronchetti, architects, Harrogate.

Annan.—Houses, Waterfoot Road (electrical work); Alexander MacLennan, architect.

Annfield Plain.—Houses (100); U.D.C. surveyor.

Becontree.—Houses, L.C.C. estate (£87,000); Henry Boot & Sons, Ltd.

Bilston.—Library, museum and art gallery, with electrical work; W. G. Lofthouse, architect, Town Hall.

Birkenhead.—Houses (240), Beryl Street; Hamilton Estates, Ltd. Technical College, Borough Road; Education Offices.

Birmingham.—Factory, Canal Street and Cliveland Street, Newtown Row, with electrical work; W. Wilkinson, Ltd., builders, Handsworth.

Bournemouth.—Cinema, Westover Road; Associated British Cinemas, Ltd., 30, Golden Square, London, W.1.

Bradford.—Houses (104), Dick Lane, Tyersal; R. Middleton & Co. Houses (318), Lister Avenue; F. Holmes & Skipton Building Society. Extensions to Grammar School (£30,000); Governors.

Brighton.—Fire station, Preston Circus (£33,973); borough engineer. New sea front (£250,000); General Purposes Committee. Elementary school, Pelham Street (£30,332), for E.C.

Brownhills (STAFFORDSHIRE).—Houses (100), Walsall Wood; U.D.C. surveyor.

Bury St. Edmund's.—Children's and private wards, West Suffolk General Hospital (£25,000); Hospital Committee.

Cambuslang (LANARKSHIRE).—Houses (150); P. C. Smith, housing engineer, 13, Clydesdale Street, Hamilton.

Cardiff.—Girls' high school, near Colchester Avenue (£30,000), for City E.C.

Caterham.—Extensions to nurses' home, mental hospital (£27,730); L.C.C. architects.

Cheltenham.—Houses (64), Whaddon Farm estate, and crematorium; borough surveyor.

Chepstow.—Houses (20), Rogiett, for the Severn Tunnel (G.W.R.) Garden Village Society; secretary.

Chester-le-Street.—Houses (38); R.D.C. surveyor.

Chichester.—Extensions and alterations to Isolation Hospital (£6,923); E. & A. Sprigings, Portsmouth.

Crewe.—School, Underwood Lane; director of education.

Dagenham.—Cinema (electrical work), for Kay Bros.; G. Coles, architect, Craven Street, London, W.C.2.

Dartford.—Houses (32), Rochester Way; H. C. Wright & Co., Ltd.

Devonshire.—Senior school, Axminster, for County E.C.; H. V. De Courcy Hague, architect, 97, Heavitree Road, Exeter.

Disley.—Houses (150), Greystone estate; A. C. Clapham, builder, Greystones.

Doncaster.—Houses (100), Harworth; Thomson & Dixon, builders.

Dudley.—Houses (28), The Broadway; S. Brooks.

Dumbartonshire.—School, Twelhar, for C.C.; J. Weekes, architect, College Street, Dumbarton.

Dunbar.—Houses (40), Parsonspod; D. W. Murdoch, burgh surveyor, Town House, Dunbar.

Dunfermline.—Houses (24), Brucefield; D. H. Shaw, burgh surveyor, City Chambers, Dunfermline.

Durham.—General hospital, Dryburn (£240,000); W. J. Merritt, county surveyor, Shire Hall, Durham.

Ebbw Vale.—Houses (52), Glyncoed; P. I. Davies, U.D.C. surveyor.

Exeter.—Swimming pool, Barnfield (£20,000); city engineer.

Felling-on-Tyne.—Senior R.C. school, Willowgate; R. Burke, architect, Singleton House, Northumberland Street, Newcastle-on-Tyne.

Fenton (STAFFORDSHIRE).—Alterations to the Plaza Cinema; manager.

Fife.—Extension to Springfield Mental Hospital (£42,400); Joint Asylum Committee, Cupar.

Gatley (CHESHIRE).—Church, for the Congregational trustees; Rev. Leslie E. Cooke, pastor.

Glasgow.—Extensions to Bannhill Institution (£250,000); Thos. Somers, city engineer, City Chambers. Extensions to Riverbank works, Pollokshaws; Brown & Adam, Ltd.

Gravesend.—Baths, Ordnance Road; borough architect.

Grimsby.—Houses (40), Nunsthorpe; Taylor & Coulbeck.

Hanwell.—Houses (1,668), &c., L.C.C. estate (£697,549); Unit Construction Co., Ltd., 1, Robert Street, London, W.C.2.

Heywood.—Houses (84), Regent Road; J. Gott, builder, Pilsworth Road.

Hinckley.—Houses (100), Jericho Farm estate; J. S. Featherstone, surveyor.

Kenton (MIDDLESEX).—Houses (696), Kenmore Park estate (£279,500); L.C.C. architect.

Kirkintilloch.—Houses, Queen's Farm and Gallowhill Avenue; J. Coates, burgh surveyor, Council Chambers, Kirkintilloch.

Lancashire.—Junior and infants' schools, Great Crosby, for County E.C.; H. Boot & Sons, Liverpool.

Lichfield.—Houses (98), Curborough Road; C. T. Read, city surveyor.

London.—(BETHNAL GREEN).—Tenements, Digby Street (£29,000); borough engineer. (HAMMERSMITH).—School, Du Cane Road (£51,849); John Laing & Son, Ltd., Mill Hill, N.W.7. (ISLINGTON).—Tenements, Loraine Place (£26,280); Rowley Bros., Ltd., Tower Works, Dunloe Avenue, N.17. (POPLAR).—Tenements, Phœnix wharf site (£77,000); L.C.C. architect. Extensions to works, Imperial Street; Kemball, Bishop & Co. (ST. MARYLEBONE).—Extension to factory, for Bovis, Ltd., Carlisle Street and Hatton Street; Wallis, Gilbert & Partners, architects, 15, Elizabeth Street, S.W.1. (STOKE NEWINGTON).—Dwellings, Glebe Place (£49,500), for L.C.C.; Edward Armstrong, architect, 5, Vigo Street, W.1. (WESTMINSTER).—Premises for St. Martin's Art School, Charing Cross Road (£100,000); L.C.C. architect.

Manchester.—Extensions to British Fondants, Ltd., Longley Lane, Northenden; Cruickshank & Seward, architects, 14, Princess Street.

Middlesex.—School (600 places), Sunbury; director of education, Eccleston Square, London, S.W.1.

Monmouthshire.—Junior School, Rumney, for E.C.; Colin Jones, architect.

Mottingham (KENT).—Houses (451), and flats, L.C.C. estate (£165,200); Wilson Lovatt & Sons, Ltd., Abbey House, Victoria Street, S.W.1.

Newbury.—Houses (28), Kiln Road; H. G. Rowlands.

Newcastle-on-Tyne.—Electric lighting installation in 487 houses, for T.C.; M. R. E. Roberts, architect, 18, Cloth Market. Showrooms (six storeys high), Prudhoe Street, for N. H. Chapman & Co.; Middlemiss Brothers, builders, Stepney Bank.

North Shields.—Ice factory for the Shields Ice and Cold Storage Co., Ltd. (£30,500); A. Anderson, builder, Sutton Street, Newcastle-on-Tyne.

Northwich.—Houses (78); R.D.C. surveyor.

Oldham.—Reconstruction of Grand Theatre (£32,000), electrical work; proprietors.

Old Hill (STAFFORDSHIRE).—Houses (140), Birmingham and Wolverhampton Road; A. & J. Mucklow, builders, High Street, Blackheath, Birmingham.

Padgate.—Houses (31), Daisy House estate, Padgate Lane; R. & H. Fletcher, Ltd., builders, Sankey Lodge estate, Liverpool Road, Warrington.

Paignton.—Houses (53), South Park estate; Primley Park; R. C. & C. C. Rees.

Richmond (SURREY).—Church, Sheen Road and Paradise Road (electrical work); W. Braxton Sinclair, architect, Craig's Court House, Whitehall, London, S.W.1.

Rochford (ESSEX).—Houses (36) and bungalows; R.D.C. surveyor.

Rottingdean (SUSSEX).—Houses (22), Valley Road; Louis Sweetman.

Royston (YORKSHIRE).—Houses (36), Cross Lane; U.D.C. surveyor.

St. Helens (LANCASHIRE).—Houses (34), Boardmans Lane; A. P. Statham, borough engineer.

Salisbury.—Houses (681); Wort & Way, builders. Houses (249), Bishop Down estate; E. J. Bundy, builder. Houses (83), Pembroke Park estate; city surveyor.

Sheffield.—Houses (70), Millhouses Lane, Millhouses; Cussins, Ltd., builders, 69, High Street. Factory, Retford Road; Batchelor & Co., Ltd., Batchelor Buildings, Stanley Street.

Shrewsbury.—Houses (42), New Park Road; J. C. Vaughan & Son, builders, Oswestry.

Shropshire.—Schools, Oswestry, Wellington and Hodnet; director of education, Shrewsbury.

Smethwick.—Extension to the technical college (£25,000); borough engineers.

Solihull.—Council House, Poplar Road (£26,704) with electrical work; Epsley & Co., Ltd., builders, Evesham.

Southampton.—School, for King Edward VI governors; Colin McCarraher, clerk.

South Shields.—Houses, Horsley Hill; J. Reid, borough engineer. Houses (56), Richardson Terrace estate; G. Bailey, Ltd., builders, King Street

Spalding.—Houses (24), Low Fulney, for the Land Settlement Association, Ltd.; Pakington & Enthoven, architects, 2, Bedford Square, London, W.C.1.

Staffordshire.—Nurses' homes and additions to Cheddleton Hospital (£46,389) with electrical work; P. Pemberton, builders, Tunstall. Senior boys' school (480 places), Stafford, for County E.C.

Stockport.—Houses (40), Patch Lane, Bramhall; Hoskers, Ltd., builders, Dean Road, Handforth, near Manchester.

Stranraer.—Creamery (£37,000), for the Scottish Co-operative Wholesale Society; architect, Scottish Co-operative Wholesale Society, Glasgow.

Sunderland.—Cinema, Pallion Road, for the Pallion Road Cinema Co., Ltd.; Bell Brothers, builders, Bk. Cleveland Road.

Surrey.—School, Banstead, Chipstead Valley (£17,380), for County E.C.; education secretary, Kingston-on-Thames.

Swansea.—Library (£34,000), for the University College Council; E. Turner & Sons, Ltd., builders.

Tonbridge.—Houses (44), Little Trench estate; B. Bishop, U.D.C. surveyor.

Troon.—Houses (122), Ballast Bank (£39,429); M. S. Brodie, burgh surveyor, Council Chambers, Troon.

Twickenham.—Cinema, Whitton; W. J. King, architect, 15, Jermyn Street, London, S.W.1.

Tynemouth.—Houses (26), Ridges estate; borough engineer. Houses (24), Sunlea Avenue; A. & E. Brannen.

Uttoxeter.—Houses (41), Slade Lane estate; A. & M. Griffiths & Son, Ltd., builders, Wolverhampton.

Warwickshire.—Schools, Southam, Kineton, Shipston, Bidford, and Stratford-on-Avon; director of education, Leamington Spa.

Welwyn Garden City.—Hospital (£25,000), for the Hospital Committee; secretary.

West Hartlepool.—Houses (110), Tips estate; borough engineer.

Westmorland.—County offices (£40,000); V. D. Rees, architect, 33, Bedford Place, London, W.C.1.

Wrexham.—Houses (36), Aston Grove, for the Town Council; borough surveyor.